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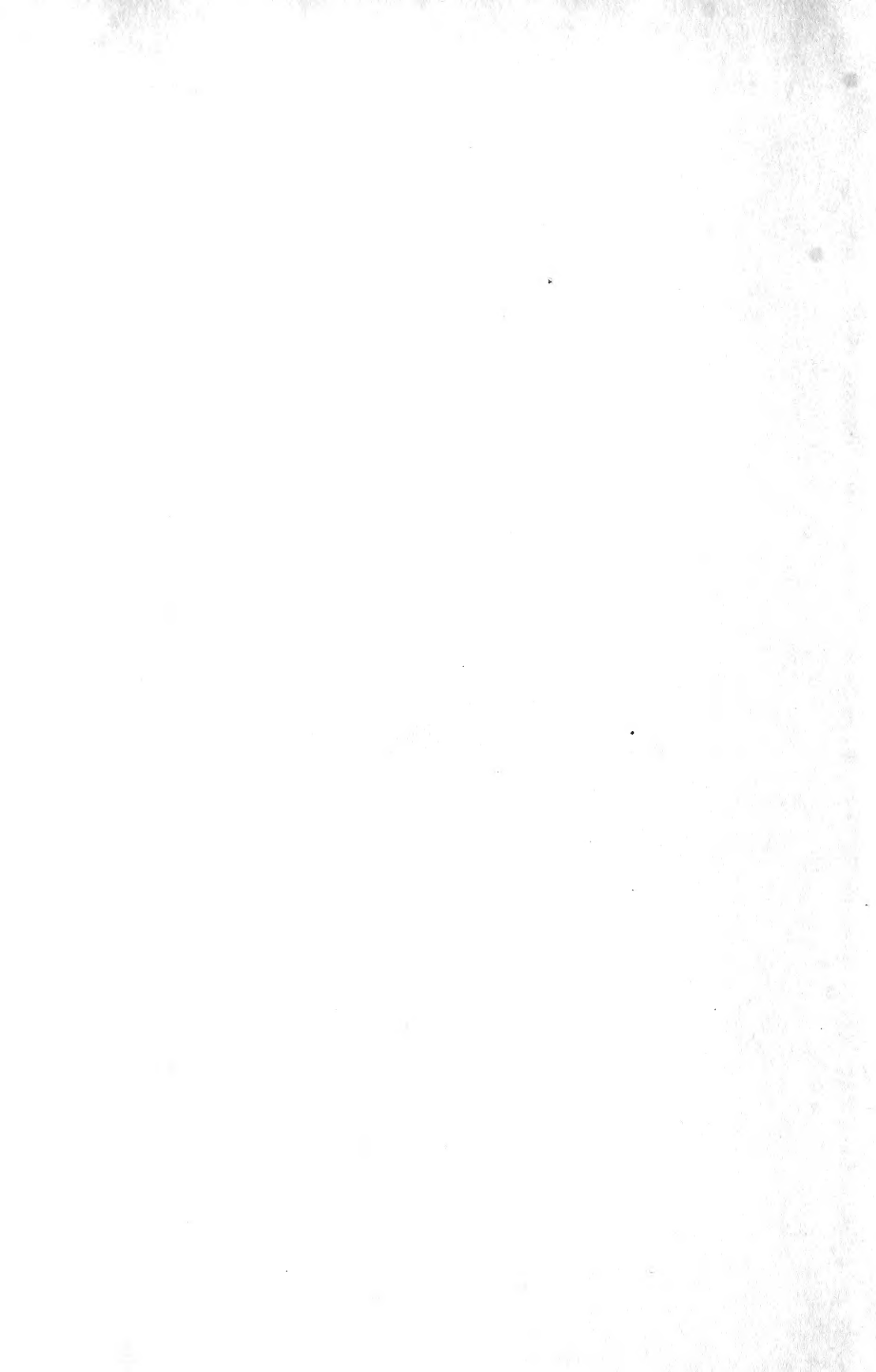
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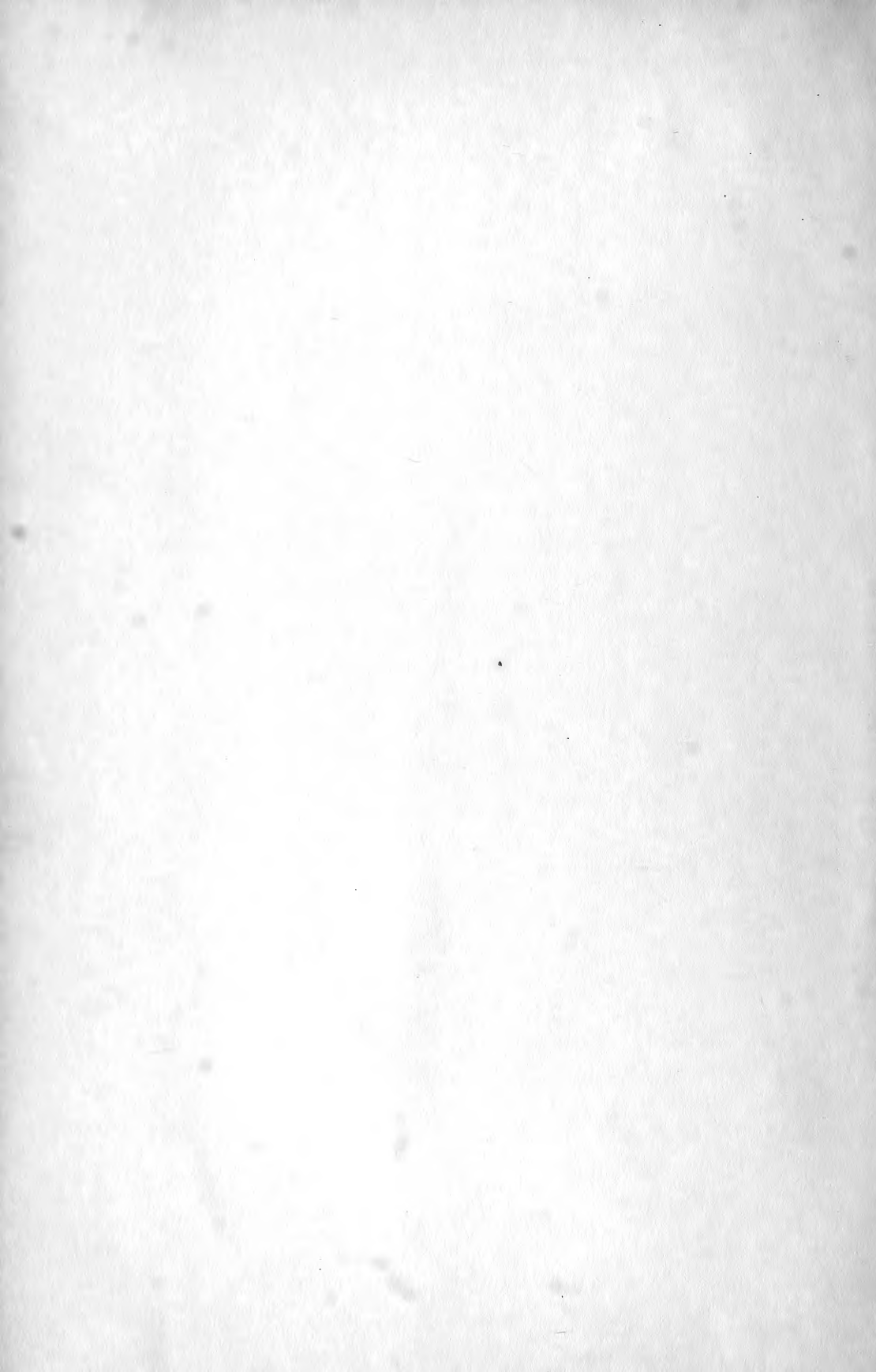


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The CANADIAN FIELD-NATURALIST

Volume 72
1958



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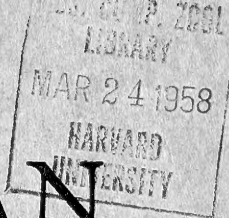
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The CANADIAN FIELD-NATURALIST

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THE OTTAWA FIELD-NATURALISTS' CLUB

FOUNDED IN 1879

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NUMBER 1

THE SIGNIFICANCE OF TURTLE BONES FROM ARCHAEOLOGICAL SITES IN SOUTHERN ONTARIO AND QUEBEC

SHERMAN BLEAKNEY

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THE AUTHOR's interest in the present and past distribution of turtles in eastern Canada has led him to examine the turtle bones and turtle shell rattles in the collection of the National Museum of Canada. The bones examined are from prehistoric archaeological sites in Ontario and Quebec and many of these specimens have been reported already by Wintenberg (1928, 1936) but upon re-examination I find that two species were overlooked and that one was misidentified. It may, therefore, be of interest to archaeologists and ethnologists to have these bones and rattles evaluated from the herpetologist's point of view.

The bone fragments were identified by comparing them with skeletal material of turtles in the herpetological collections of the National Museum of Canada. Because the eight species of turtles which occur in Ontario belong to seven distinct genera, it was relatively easy to make accurate determination on many of the fragments. Approximately 100 fragments were determined as follows: two pieces of Wood Turtle, four pieces of Box Turtle, 26 pieces of Blanding's Turtle, 33 pieces of Painted Turtle and 35 pieces of Snapping Turtle shell.

Perhaps the most significant observation was that of the eight native species of Ontario turtles only three were represented in any abundance in the bone collections, and one of these species constituted the bulk of the material. The dominant species was the Midland Painted Turtle *Chrysemys picta marginata*, a ubiquitous pond turtle. (Although there are numerically more Snapping Turtle bones many of them are from a single turtle). The two other species are Blanding's Turtle *Emys blandingi* and the Snapping Turtle *Chelydra serpentina serpentina*, also turtles of the shallow water habitat. (Wintenberg reported only the Painted, Snapping and Wood Turtle and I believe that the bones of Blanding's Turtle were mistaken for those of the Wood Turtle. They are similar in size but not in structure). In southern Ontario there are two other species of pond turtle, the Spotted Turtle *Clemmys guttata* and Musk Turtle *Sternotherus odoratus*; two species of river and lake turtle, the Map Turtle *Graptemys geographica* and Spiny Softshell Turtle *Trionyx ferox spinifera*; and one terrestrial turtle, the Wood Turtle *Clemmys insculpta*. In June the females of all these species leave the water in search of drier areas in which to lay their eggs and during this sojourn on land they are easily caught. There arises, then, the problem of why their shells are absent or scarce in the Indian middens, graves, or other sites, as represented in National Museum collections. To begin with, the adult Spotted and Musk Turtles are only four inches long and for this reason they may not have been considered worth the trouble of cooking. The strong odor of the latter species would be a further

Mailing date of this number: 14 March 1958

deterrent. Some of the larger forms, such as the Map Turtle and Softshelled Turtle, are faster, more secretive and very difficult to catch. The large but meek terrestrial Wood Turtle must have been encountered by the Indians along their trails; yet only two shell fragments (from Roebuck Site, Wintemberg, 1936) were evident in the material examined. If in truth this species was avoided it may have been due to two factors. First, this turtle, and the Box Turtle, eats mushrooms including poisonous ones and in the case of the latter the poison will adversely affect persons eating the turtle. Secondly, the red or orange color of the skin of the neck and legs of this turtle may have encouraged the belief that it was poisonous, especially if a few cases of poisoning had been experienced by the tribe.

The Midland Painted Turtle is without doubt the most conspicuous and abundant of the three common species recorded and would be the one species that could have been easily caught. It is probable that these three species were caught in the lush plant and algal growths of shallow waters, chiefly by the children, who must have quickly learned how to catch and hold a Snapping Turtle by its tail.

Bones of one other species of turtle, the Box Turtle *Terrepenne carolina* were identified in the collections. This species is not native to Canada but is common in eastern United States and ranges northwards to near the southern shore of Lake Erie. The bones are from three widely separated sites (see accompanying list). In every case the bones have holes drilled through them indicating that these Box Turtles shells were utilized as rattles (Figure 1, C). In one instance (Kalton Co.) the entire carapace was intact. Perhaps rattles were widely traded, and if so, it is reasonable to postulate that these rattles were imported into Ontario from somewhere south of Lake Erie and that the Box Turtle was never native to Ontario. There is the alternative explanation that the species was present in Ontario during the Thermal Maximum and has become extinct since that time. However, there is no supporting evidence and even if the climate of southern Ontario were suitable during the Thermal Maximum, the Great Lakes—St. Lawrence waterway would serve as an effective barrier to the dispersal of this essentially terrestrial turtle.

It is perhaps of significance that the Indians of Ontario now construct their rattles from Snapping Turtle shells. (There are 10 of these interesting rattles in the ethnological collections of the National Museum of Canada). Their relations to the south have continued to employ the shell of the Box Turtle for rattle boxes. This is evident from two Box Turtle rattles at the National Museum of Canada which were collected from the Seneca Tribe on a reservation in Oklahoma, having been brought by them from their home territory in New York State to this reservation.

Aside from the rattles only three bones showed signs of having been utilized in some way. All these bones were from Blanding's Turtle shells and two are shown in Figure 1. The smaller bone is 2nd Right Peripheral Bone of carapace (VIII-F-8754) and its original sharp edge has been worn down considerably (Figure 1, B). The second bone was the anterior half of the left Xiphoplastron Bone (VIII-E-1119) and it has been notched, possibly for the purpose of marking on pottery (Figure 1, A). Notice how nicely the natural shape suits the grip of the hand and how pressure could be exerted easily by the thumb against the ridge. Blanding's Turtle bones were found at six sites,

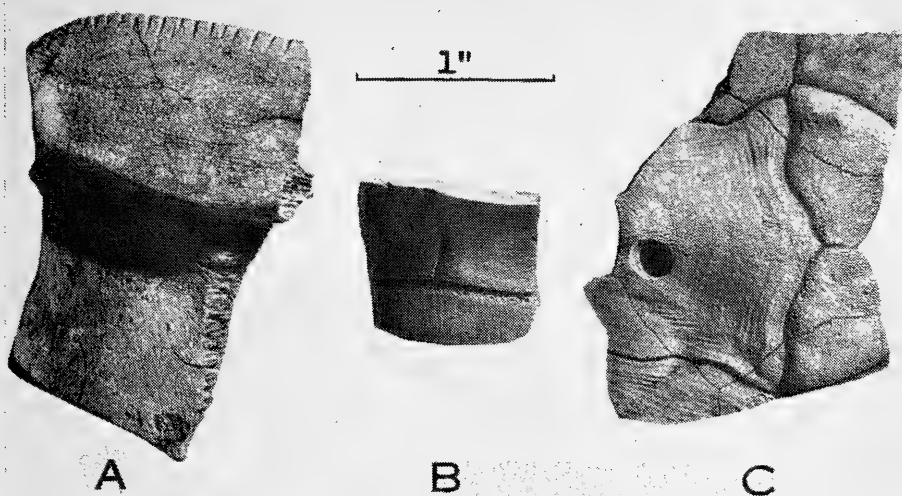


FIGURE 1. Turtle bones showing evidence of having been utilized by Indians as (A) pottery decorator, (B) scraper, and (C) rattle. (A) Xiphiplastron bone of Blanding's Turtle which has been notched, (B) Peripheral bone of Blanding's Turtle which has had the sharp margin worn down and (C) fragment of Box Turtle carapace with drilled hole.

five of them well within the species' known range, but the fourth location, that of the notched Xiphiplastron just mentioned, was near Lanoraie, Berthier County, Quebec. This is 125 airline miles from Ottawa, which is the nearest known locality for the species. Presumably an Indian fashioned this interesting tool somewhere in southern Ontario or southern New England and carried it about subsequently losing or discarding it near Lanoraie.

The third bone (VIII-F-1719b) consists of most of the left anterior half of a plastron of Blanding's Turtle and has one hole drilled at the left upper margin and another drilled at the center line. This suggests that an attempt had been made to create a rattle from a Blanding's Turtle shell. The anterior half of the plastron of this species is hinged, but the posterior half is fixed and would present the problem of sealing the opening around the posterior half of the shell. The Box Turtle has both halves of the plastron hinged and is therefore ideally suited for conversion to a rattle box.

Wintemberg figured a turtle bone ornament and a partially reconstructed shell in his 1926 report on the Uren site. Unfortunately, these specimens (VII-F-1719a and VIII-F-16601a-f) could not be found but the text figures are most certainly of Blanding's Turtle. The pendant was made from the anterior half of a Blanding's Turtle plastron, the portion which in life is hinged. The reconstruction consists of the posterior half of a turtle's carapace.

Some rather interesting conclusions can be formulated from an analysis of this chelonian archaeological material and they are presented here by way of a summary. These conclusions are admittedly speculative, but they do indicate the potential of information which lies dormant in archaeological bone collections.

1. Because only three of the eight species of turtles native to Ontario were consistently common in these bone collections, I conclude that the Indians of the villages represented did not actively pursue turtles for food. If they had hunted or trapped turtles diligently, there certainly would have been more species represented in these bone collections.

2. The three turtle species in question, the Midland Painted Turtle, the Snapping Turtle, and the Blanding's Turtle, all inhabit shallow weed-choked ponds and bays, precisely places where children are prone to explore. Probably food supplies were supplemented with turtles caught by the children.

3. The Indians must certainly have encountered the terrestrial Wood Turtle more often than is indicated by the only two bones found in the bones examined. Dogs are very adept at locating this species of turtle (bird dog trainers often use Wood or Box Turtles to train Pointers) and it seems reasonable to believe that the activities of the Indian's dogs would reveal many Wood Turtles that would otherwise be overlooked. One probable explanation is that the Indians avoided this species because of known cases of poisoning from it, due to its habit of feeding on poisonous fungi. The orange and red color of the Wood Turtle's skin would serve to strengthen any suspicion of its being poisonous.

4. The Box Turtle and the Snapping Turtle are the only two northeastern species whose shells can conveniently be modified into ceremonial rattles. A few Box Turtle bones were identified from Ontario sites but this species is not native in Canada. Because of this and the fact that all these bones had holes drilled through them, it is concluded that these bones came from turtle shell rattles imported from south of the Great Lakes. The shell of this turtle is ideally suited for a rattle because both the anterior and posterior half of the plastron are hinged and when shut they transform the shell into a box of bone. No other northeastern turtle is similarly constructed and therefore all others are difficult to convert to a closed container. However, the Snapping Turtle has so little ventral shell and so much exposed skin that the skin can be cut, the shell cleaned out, and the tough skin sewed together again. The result is a box which is half bone and half drum head. This is precisely what the Ontario Indians now employ. There are ten of these recent Snapping Turtle rattles at the National Museum of Canada.

The author is indebted to Mr. T. E. Lee of the Human History Branch of the National Museum of Canada for suggesting this study and for his professional advice from an archaeologist's viewpoint.

LIST OF BOX, WOOD AND BLANDING'S TURTLE IDENTIFICATIONS

Terrepepe carolina BOX TURTLE

1. VIII-F-14257. Lake Medal, Nelson Tp., Halton Co., Ontario, 1884.
2. VIII-F-14270. East Gore, Northumberland Co., Ontario, 1884.
3. VIII-F-20527, 20528. Sidney Mackay site, Nottawasaga Tp., Simcoe Co., Ontario, 1926, (A, Figure 1, is 20528).

Clemmys insculpta WOOD TURTLE

1. VIII-F-13926, 13992. Roebuck Site, Grenville Co., Ontario, 1915.

Emys blandingi BLANDING'S TURTLE

1. VIII-E-1119. Lanoraie, Berthier Co., Quebec, 1927. (Figure 1, C).

2. VIII-F-17795 a,b,c,g. London Tp., Middlesex Co., Ontario, 1923.
3. VIII-F-5306. Bayham Tp., Elgin Co., Ontario, no date.
4. VIII-F-8754. Middleport, Onondago Tp., Brant Co., Ontario, 1921. (Figure 1, B).
5. Eleven collections. Roebuck Site, Grenville Co., Ontario, 1915.
6. Nine collections. Uren Site, Oxford Co., Ontario, 1920.

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- . 1936. Roebuck Prehistoric Village Site, Grenville County, Ontario. Bull. nat. Mus. Canada No. 83.

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THE SUPPOSED OCCURRENCE AND NESTING OF THE SLATY-BACKED GULL IN THE WESTERN ARCTIC REGION OF CANADA

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THE A.O.U. checklist of North American Birds (1931) lists the Slaty-backed Gull *Larus schistisagus* as of casual occurrence in Alaska and in Franklin Bay, N.W.T. The latter statement appears to be based on an adult reported to have been collected June 9, 1901, and identified by Dr. A. K. Fisher in 1902 (Preble, 1908). When I informed Mr. W. E. Godfrey, National Museum of Canada, of my intention to visit this area, he pointed out to me the following breeding record in Bent (1921, p. 87): "There are two sets, of three eggs each, in Col. John E. Thayer's collection, taken by Capt. H. H. Bodfish in Harrowby Bay, on the Arctic coast of northwestern Canada, June 11, 1901." It is further stated that the nests were "on a point making into the bay," and that the parent birds were collected and the skins identified by Mr. Robert Ridgway and Dr. A. K. Fisher. Ridgway (1910), however, in his manual of North American birds makes no reference to this breeding record.

I was able to spend the period July 18 to 23, 1955, on Harrowby Bay. During this time, the coastline of the bay was covered in part on foot, while the remainder was seen from a distance of not over half a mile from a boat by Dr. J. R. Mackay, who was conducting a survey for the Geographical Branch, Department of Mines and Technical Surveys, Canada, or by both of us together. On July 23, I made a low-level airplane flight from the north shore of Harrowby Bay over its apex and the old river channel which enters it and across to the mouth of the Horton River, the valley of which was followed for its lowermost twenty miles. Our flight altitude was such that Glaucous Gulls seen below were readily identified. Throughout our stay in the area, neither Mackay nor myself saw any large gulls other than *Larus hyperboreus barrovianus*. An adult of this form was collected and a downy youngster was

seen on the Bay. Six other Glaucous Gulls collected in the mouth of the Anderson River some thirty miles south of Harrowby Bay were also determined to belong to this subspecies.

A. M. Bailey's (1948, p. 240, 241) account of the Slaty-backed Gull as a bird on the Alaskan list contains decisive information in connection with the alleged Canadian records cited above. Bailey states there is only one skin labeled "shot from the nest," said to have been collected by Bodfish on June 9, 1901, in Harrowby Bay. On re-examination by Bailey the bird's wing length was found to be only 417 mm and he pronounced it definitely not a Slaty-backed Gull but did not state his conclusions as to its actual identification. The other 'Bodfish gull' apparently associated with this specimen in Bent's account, is said to have been taken in Alaska in 1903. This specimen Bailey judged actually to be a Slaty-backed Gull.

Bodfish, in his biography (1936) states that he wintered at Baillie Islands in 1900-1901 but although he reports finding Snowy Owl's eggs in May and early June and the taking of goose and swan eggs on June 26, 1901, in the text covering this period he makes no mention of gulls or of Harrowby Bay. Clearly, he did not find any gulls that seemed at all unusual to him in 1901, nor is the Slaty-backed Gull mentioned anywhere in his book. It seems highly probable in view of the identical dates of collection that the 'Bodfish Harrowby Bay Gull' is the same as that cited by Preble as having been collected in Franklin Bay; in any case, the specimen as shown by Bailey is not a Slaty-backed Gull. Both the eggs and the skin may have been acquired by Bodfish from natives from whom, according to his account, he bought game and curios at various times.

It follows from the above that there is no valid record of *Larus schistisagus* for Canada or the adjacent seas nor any evidence that this gull has nested on the North American continent.

ACKNOWLEDGMENT

My field work in 1955 was supported by a research grant from the Banting Fund to the Arctic Institute of North America.

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BIRDS OF CAPE BRETON ISLAND, NOVA SCOTIA

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THE MAIN sources of the following data, in addition to the scattered literature, are two expeditions of the National Museum of Canada to Cape Breton Island, Nova Scotia. In 1935, V. E. Gould, assisted by the writer, made a survey of the mammals of the island in the period August 18 to October 26. Although bird studies were secondary to those of mammals, a considerable amount of ornithological information was recorded and 229 bird specimens were collected. Base camps were at Cape North, August 18 to September 25; Frizzleton, September 26 to October 15; and St. Peters, October 16 to 26. Several attempts to reach St. Paul Island, off the northern tip of the island, were unsuccessful because of inclement weather.

The writer again visited Cape Breton Island in 1954 to study the summer birds in the period June 4 to August 5. With the assistance of R. J. d'Entremont, 326 bird specimens were secured and observations were made in various parts of the island.

Other valuable sources of data were the meticulous notes made by J. E. V. Goodwill, Canadian Hydrographic Service, Ottawa, in the summer of 1946 and 1947; a manuscript report of birds observed by Austin W. Cameron during July, 1945, in Cape Breton Highlands National Park; and a manuscript list by C. H. D. Clarke of birds observed by him in the Park between August 9 and 26, 1941.

Austin W. Cameron, Curator of Mammalogy, National Museum of Canada, Ottawa, lived for several years at Port Hood, Cape Breton Island, and furnished particularly useful seasonal information. Additional valuable data were made available through the observations of Robie W. Tufts, D. B. O. Savile, P. A. Taverner, James Bond, R. M. Anderson, and J. S. Erskine. Mr. Erskine's list of 34 bird species he found on St. Paul Island, August 10 to 17, 1953, is especially useful.

Most of the available information on Cape Breton Island birds was secured in spring, summer, and autumn. Adequate observation in winter would probably add several species to the list and clarify the winter status of others.

COMMON LOON *Gavia immer* (Brünnich). Occurs regularly in summer along the coast; breeds on freshwater lakes. A nest was observed by the writer on the west side of Lake Ainslie on July 7, 1954.

PIED-BILLED GREBE *Podilymbus podiceps podiceps* (Linnaeus). Breeds locally. Nine were counted in the freshwater marshes near Scotsville, Inverness County, on July 5, 1954. At Grande Anse, Richmond County, an adult was seen passing food to a flightless young bird on July 19 and 20, 1954. Not previously recorded.

SOOTY SHEARWATER *Puffinus griseus* (Gmelin). Townsend (1906) saw four south of Cape Breton Island between August 17 and September 5, 1905. The writer noted two about ten miles at sea off Dingwell on August 24, 1935.

GREATER SHEARWATER *Puffinus gravis* (O'Reilly). One was seen at sea south of Cape Breton Island by Townsend (1906) between August 17 and

September 5, 1905. In 1953, Erskine (MS.) noted it occasionally in August near St. Paul Island.

LEACH PETREL *Oceanodroma leucorhoa leucorhoa* (Vieillot). Breeds in colonies usually on coastal islands. In 1954, we located a small colony near Louisburg on July 26. Some 23 pairs of wings were scattered about the ground, the work of some predatory animal. Bayley (1925) stated that it breeds in large numbers on Hertford and Hiboux (=Ciboux) islands. Gross (1937) recorded a thriving colony on St. Paul Island, and Erskine (MS.) saw a nestling there in August, 1952, which had been killed by a dog.

WILSON PETREL *Oceanites oceanicus oceanicus* (Kuhl). Probably a regular summer nonbreeding visitor to offshore waters. Townsend (1906) apparently observed it south of Cape Breton Island in late summer, 1905. Austin W. Cameron (oral) noted several near Port Hawkesbury about August, 1943.

BROWN PELICAN *Pelecanus occidentalis* subsp. Accidental. Whiteaves (1904) recorded a male which was shot at Louisburg on May 19, 1904.

GANNET *Morus bassanus* (Linnaeus). Transient, sometimes common in spring and autumn along the coast; uncommon nonbreeding summer visitant. The writer noted 20 off Dingwall Bay on August 24, 1935, and two off Briton Cove on June 13, 1954. Townsend (1906) saw one between Ingonish and Sydney on September 1, 1905. Bayley (1925) states that a few visited Hertford Islands occasionally. Austin W. Cameron (oral) has sometimes found it common in November off Port Hood.

EUROPEAN CORMORANT *Phalacrocorax carbo carbo* (Linnaeus). Permanent resident, scarcest in winter. Breeds in colonies of various size along the coast. Specimens examined—Dingwall Bay: 2 subadults; August 28, 1935.

DOUBLE-CRESTED CORMORANT *Phalacrocorax auritus auritus* (Lesson). Common summer resident inhabiting both salt and fresh water. Breeds.

GREAT BLUE HERON *Ardea herodias herodias* Linnaeus. Common summer resident; breeds. In 1935, we observed it almost daily, 33 being the largest number seen in a day (June 29). One was noted at St. Peters on October 21, our latest autumn date.

AMERICAN EGRET *Casmerodias albus egretta* (Gmelin). Casual summer visitor. Grosvenor (1931) carefully identified two some four or five miles from Englishtown on August 18 and 19, 1930.

AMERICAN BITTERN *Botaurus lentiginosus* (Rackett). Summer resident in marshes. Noted by us near Baddeck, Scotsville, East Margaree, Strathlorne, Grande Anse, and Cape North. Latest autumn observation September 18, 1935, at Cape North.

WHISTLING SWAN *Olor columbianus* (Ord). Robie W. Tufts (oral) has informed me that one was shot illegally by a hunter in Richmond County in late autumn, 1919. One of two individuals near Louisburg on March 21, 1932, was captured in a weak condition and presented to the Sydney Park Commission. Its wings were clipped but later when it regained its ability to fly it was liberated.

ATLANTIC CANADA GOOSE *Branta canadensis canadensis* (Linnaeus). Regular spring and autumn transient. At Judique, Inverness County, Cameron (oral) observed about 200 in spring, 1954, and about 30 near Mabou on December 23,

1954. Tufts (MS.) has found it wintering occasionally at Big Glace Lake, Lingan Bay, and Mira Bay.

BLACK DUCK *Anas rubripes* Brewster. Common. Breeds. In 1954 we saw 28 broods of young in well distributed localities. In 1935 also it was noted in fair numbers at Cape North and Frizzleton. Specimen examined—Frizzleton (1).

GREEN-WINGED TEAL *Anas carolinensis* Gmelin. Scarce summer resident; commoner in migrations. In 1935 at Cape North we saw two on September 7 and six on September 22. In 1954, we noted two at Cape North on June 20; one at Strathlorne on July 8; and two at L'Ardoise on August 1.

BLUE-WINGED TEAL *Anas discors* Linnaeus. Uncommon summer resident; breeds. In 1954 we noted it on Madame Island June 4(1); at Indian Bay near Baddeck between June 6 and July 15 two adults were seen regularly and on July 12 there were three downies there. Noted also at Nyanza, June 6(4); Margaree Forks July 7(1); East Margaree July 9 (2 ad., 2 broods of downies).

RING-NECKED DUCK *Aythya collaris* (Donovan). Although apparently not previously recorded, this duck is locally not uncommon in summer, breeding in freshwater marshes. In 1954, the writer counted 26 adults at Indian Bay on June 6 but the number decreased somewhat subsequently. At Nyanza three were observed on June 15; at Scotsville on July 5 six adults and broods of nine and six downy young; on the west side of Lake Ainslie on July 7 four adults and nine downies. Three broods of young were seen at Indian Bay on July 15 and an adult with seven young near Sydney on July 25 and 26.

AMERICAN GOLDEN-EYE *Bucephala clangula americana* (Bonaparte). Common and widely distributed; breeds. In 1954, a total of 11 broods of young were seen. On several occasions in early June, near Nyanza, one or both of a pair were taken from a fireplace, having gained access by way of the chimney presumably in search of a nesting place.

OLD-SQUAW *Clangula hyemalis* (Linnaeus). A fall, winter, and spring visitor; rare in summer. On July 17, 1954, the writer observed four on Lennox Passage, Madame Island. Each time the area was visited again on July 18, 22, and 28 these ducks were noted at about the same place. Bayley (1925) says that it is common throughout the fall and winter, departing for the north about the end of April.

HARLEQUIN DUCK *Histrionicus histrionicus* (Linnaeus). Bayley (1925) recorded occasional flocks of from four to six about Hertford Islands during November and December. Taverner (MS.) saw three locally-taken specimens without further data.

AMERICAN EIDER *Somateria mollissima dresseri* Sharpe. Permanent resident. Bayley (1925) said that it is common in winter about Hertford Islands. V. E. Gould noted about 30 near Sea Wolf Island, Inverness County, and collected a subadult male, on October 11, 1935. Bond (MS.) saw flocks at Capstick in July, 1949. The writer saw two off Chimney Corner, Inverness County, on July 4, 1954. Specimen examined—Sea Wolf Island: 1 subadult ♂; October 11, 1935.

[**KING EIDER** *Somateria spectabilis* (Linnaeus). Hypothetical. Bayley (1925) states that it is of rare occurrence in winter.]

WHITE-WINGED SCOTER *Melanitta deglandi* (Bonaparte). Common in

autumn near Hertford Islands (Bayley, 1925). Taverner (MS.) saw a mounted male and female at the Hertford Island Lighthouse. Clark (MS.) saw a large flock at Aspy Bay on August 19, 1941.

AMERICAN SCOTER *Oidemia nigra americana* Swainson. A nonbreeding permanent resident. Bayley (1925) says that it is common near Hertford Islands in autumn, and Taverner (MS.) saw two mounted adults at the lighthouse there. The writer saw 78 off Madame Island on June 4, 1954, and ten there regularly from July 17 to 28.

SURF SCOTER *Melanitta perspicillata* (Linnaeus). A nonbreeding permanent resident. Bayley (1925) says that it is common near Hertford Islands in autumn, and Taverner (MS.) saw two mounted adults at the lighthouse there. The writer saw 78 off Madame Island on June 4, 1954, and ten there regularly from July 17 to 28.

HOODED MERGANSER *Lophodytes cucullatus* (Linnaeus). Bond (MS.) in 1949 observed a female at Warren Lakes and a male five miles south of Baddeck in July, 1949.

AMERICAN MERGANSER *Mergus merganser americanus* Cassin. Generally less common than the Red-breasted Merganser. Breeds. On August 22, 1935, the writer saw about 30 at Cape North and collected two flightless young. In 1954, he noted it at Madame Island (2 on June 4); at Nyanza (30); at Cape North (5 on June 22); at East Margaree (2 adults on July 3, and 1 adult with 12 downies on July 8.)

RED-BREASTED MERGANSER *Mergus serrator serrator* Linnaeus. Rather common throughout the island; breeds. In 1954, I saw 12 broods of young in various parts of the island. Gross (1937) recorded a brood at Port Bevis on August 26, 1934. Specimen examined—Dingwell Bay: 1 juv.; August 29, 1935.

TURKEY VULTURE *Cathartes aura septentrionalis* Wied. Casual visitor. Tufts (1927) recorded an immature specimen taken about ten miles from Sydney on November 8, 1913, by J. N. McPhee. Goodwill (1948) observed one near Bucklaw, Inverness County, on October 12, 1946.

EASTERN GOSHAWK *Accipiter gentilis atricapillus* (Wilson). In 1935 the writer took a specimen on September 9 and another on September 12 at Cape North. In 1954 an adult was seen at Indian Bay on June 29 and another on Sporting Mountain on July 19. Specimens examined—Cape North: 2 juv.; September 9 and 12, 1954.

SHARP-SHINNED HAWK *Accipiter striatus velox* (Wilson). Breeds. The writer has noted it at Cape North (August 22 and 28; September 21); at Thibeaupville on July 31; and near Grande Anse where an adult with two young was seen on August 5, 1954.

[COOPER HAWK *Accipiter cooperi* (Bonaparte). Hypothetical. Townsend (1906) vaguely mentioned this species without giving details. Goodwill (MS.) has a sight record of one near Whycocomagh on July 10, 1946.]

EASTERN RED-TAILED HAWK *Buteo jamaicensis borealis* (Gmelin). Fairly common summer resident. In 1935 we observed 26 individuals between August 19 and October 12 at Cape North and Frizzleton. In 1954, we saw 18 individuals between June 4 and August 2. One collected near Baddeck on July 13, 1954, had five shrews *Sorex cinereus* and a wood frog *Rana sylvatica* in its stomach. Specimen examined—Baddeck: 1 ad. unsexed; July 13, 1954.

[RED-SHOULDERED HAWK *Buteo lineatus* (Gmelin). Erroneously recorded by Townsend (1906).]

[BROAD-WINGED HAWK *Buteo platypterus* (Vieillot). Hypothetical. Townsend (1906) vaguely reported seeing one. Later (*in* Burns, 1911) he stated that the bird in question was observed at Ingonish on August 29, 1905.]

ROUGH-LEGGED HAWK *Buteo lagopus s. johannis* (Gmelin). One near Baddeck on November 7, 1946, was observed by Goodwill (MS.)

NORTHERN BALD EAGLE *Haliaeetus leucocephalus alascanus* Townsend. In the rugged wooded hills of Cape Breton the Bald Eagle finds an abundance of nesting places and the numerous waters contain an adequate supply of fish for its food. Therefore, this fine bird is still a common sight in most parts of the island. In spring, eagles are attracted to the rivers by the abundant alewives *Pomolobus pseudoharengus* that ascend the rivers to spawn. On June 19, 1954, the writer counted 12 Bald Eagles on a particularly favored 150 yards of Baddeck River. Nests were seen near Indian Bay, Victoria Co.; Strathlorne, Inverness Co.; and near Louisburg. The Strathlorne nest on July 14 contained one large young. The Louisburg nest on July 26 contained a juvenal which flew the following day. In August, 1953, Erskine (MS.) found it common on St. Paul Island and saw one flock of eleven.

On July 5, 1954, a Bald Eagle was seen on the water some 110 feet from shore. It progressed rather rapidly toward shore with occasional wing flaps but it was propelled apparently mainly by the feet. On reaching shore it was seen to have a fish in its talons.

At Whale Cove, near Margaree Harbour, on July 4, 1954, the writer saw a Bald Eagle attempt an attack on a Double-crested Cormorant. Legs dangling, the eagle hovered like an osprey some 60 yards above the cormorant then swooped at it. The cormorant escaped by diving under water. The eagle left the scene but returned a few minutes later and the procedure was repeated.

The smaller Southern Bald Eagle *H. l. leucocephalus* may visit Cape Breton Island in summer as is the case in other parts of Nova Scotia. Specimen examined: Cape North: 1 subadult ♂; September 20, 1935.

MARSH HAWK *Circus cyaneus hudsonius* (Linnaeus). Not uncommon summer resident about marshes, meadows, and hayfields. Specimen examined—Cape North: 1 juv. unsexed; August 27, 1935.

OSPREY *Pandion haliaetus carolinensis* (Gmelin). A rather common summer resident in most parts of the island near water. On June 5, 1954, at Lake Ainslie, one repeatedly 'dive-bombed' a Bald Eagle as the latter sat in a tree eating a fish. The eagle faced its attacker with open mouth but the Osprey never actually struck it.

DUCK HAWK *Falco peregrinus anatum* Bonaparte. Goodwill (MS.) saw one at Gillis Point on September 16, 1946.

EASTERN PIGEON HAWK *Falco columbarius columbarius* Linnaeus. One was seen by Bond (MS.) between July 3 and July 15, 1949. In 1935 we observed it at Cape North on August 20(1), 22(1), 27(1); September 4(2), 5(1), 7(1), 12(2), 18(1), 21(2); and at Frizzleton one on October 8. Goodwill (MS.) saw one on June 20, 1946, near Baddeck and another on July 24. Cameron (MS.) noted one the actions of which suggested breeding on North Mountain, July 23, 1945. Specimens examined—Cape North: 2 juv. ♀; September 4-12, 1935.

EASTERN SPARROW HAWK *Falco sparverius sparverius* Linnaeus. Fairly common summer resident throughout the island; breeds.

CANADA SPRUCE GROUSE *Canachites canadensis canace* Linnaeus. Permanent resident in coniferous forests throughout. In 1935 we recorded it at Cape North on August 22(2) and September 11(1); at Frizzleton it was seen daily October 1 to 6; and one was noted near St. Peters on October 19. In 1954 we saw it only in the vicinity of Sporting Mountain where broods of well-grown young were present on July 19 and 20. Specimens examined—Edge of Flat Barren, Victoria Co.: 2 ♂, 2 ♀; October 5-8, 1924. Cape North: 1 ♂; 1 ♀; August 22-September 11, 1935. Frizzleton: 2 ♂; October 5-9, 1935.

Birds from the Maritime Provinces have been separated and named *torridus* by Uttal (1939). Rand (1948), however, found the postulated characters not consistently different from those of *canace*. The material from Cape Breton examined in the present connection does not clearly suggest the recognition of *torridus* although there is a tendency toward intensification of browns in females from the Maritimes.

CANADA RUFFED GROUSE *Bonasa umbellus togata* (Linnaeus). Permanent resident in most wooded parts of the island. Specimens examined—Cape North; 1 ad., 4 imm.; September 3-4, 1935.

B. u. thayeri Bangs, with type locality at Digby, Nova Scotia, does not appear to be separable from *B. u. togata*; consequently Cape Breton Island specimens are referred to *togata*.

RING-NECKED PHEASANT *Phasianus colchicus* Linnaeus. Introduced. The writer observed a male at Grande Anse on July 19, 1954. Cameron (oral) saw a male at Judique on May 21, 1953, and informed me that a female spent most of December, 1954, at Port Hood.

[VIRGINIA RAIL *Rallus limicola* Vieillot. Hypothetical. This species was doubtfully recorded by Dwight (1887).]

SORA *Porzana carolina* (Linnaeus). In 1954, the writer noted one individual of this species at Indian Bay, Victoria County, on June 15; one at Scotsville on July 5; and one at East Margaree on July 9.

PURPLE GALLINULE *Porphyryla martinica* (Linnaeus). Accidental. Robie W. Tufts (*in litt.*) states that, according to the notes of the late Harry Piers, one was taken on Scateri Island about July 1, 1915, and sent to F. C. Bell, Sydney taxidermist, for mounting.

LAPWING *Vanellus vanellus* (Linnaeus). Accidental. A. J. Matheson (*in litt.*) described and sketched very clearly a Lapwing taken at Lower L'Ardoise, Richmond County, in late 1927 or early 1928. In as much as large numbers of this Old World plover are known to have visited other points near by on the Atlantic coast of Canada late in 1927, there is no reason to doubt this record.

EASTERN PIPING PLOVER *Charadrius melodus melodus* Ord. The only record seems to be that of an immature taken by the writer at Dingwall Bay on August 28, 1935. Specimen examined—Dingwall Bay: 1 juv. ♀; August 28, 1935.

SEMIPALMATED PLOVER *Charadrius semipalmatus* Bonaparte. Common migrant and rare local breeder. On June 13, 1954, we found a nest on a stony beach at Jersey Cove, near Englishstown. This nest contained eight eggs,

apparently the product of two females. Specimen examined—Cape North: 1 ad. ♂; August 28, 1935.

BLACK-BELLIED PLOVER *Squatarola squatarola* (Linnaeus). Migrant. Observed regularly between August 17 and September 22, 1935, about 50 being the largest number seen in a day (September 18). In 1954 it was first noted on July 25 when one was seen at Louisburg. Specimens examined—Cape North: 2 ad. ♀; August 19, 1935.

RUDDY TURNSTONE *Arenaria interpres morinella* (Linnaeus). Migrant. Commonest in late summer and early autumn. Earliest autumn observation July 18 (7 at L'Ardoise). Specimen examined—Dingwall Bay: 1 juv.; August 28, 1935.

AMERICAN WOODCOCK *Philobela minor* (Gmelin). Fairly common summer resident. Judging by the number of flight songs heard, it was relatively plentiful in the Baddeck region in 1954. Seasonally latest flight song heard on June 23, 1954, near Cape North. Cameron (oral) has seen flightless young on Port Hood Island. A Woodcock banded at Fairhope, Alabama, on December 16, 1932, was recovered at Sydney, Cape Breton Island, on October 31, 1933.

WILSON SNIPE *Capella gallinago delicata* (Ord). Common summer resident in freshwater marshes throughout. Specimens examined—Cape North: 2 ♂; August 19-27, 1935.

[LONG-BILLED CURLEW *Numenius americanus* Bechstein. Hypothetical. Bayley's (1925) account of reports of curlews with long bills is not convincing evidence of the occurrence of this species.]

HUDSONIAN CURLEW *Numenius hudsonicus* Latham. Migrant. Taverner (1942) quotes R. W. Tufts as follows: "Hundreds occur locally in Richmond and Cape Breton counties and along the southwest shore of mainland during July and August of each year." In 1954, we observed more than 100 in the extensive mats of *Empetrum nigrum* near Black Point at Louisburg on July 24 and there were seven at Port Morien on July 27. One at Grande Anse on July 22 was seasonally our earliest record. Bayley (1925) reports that it is an occasional migrant on the Hertford Islands in flocks of from six to fifty.

SPOTTED SANDPIPER *Actitis macularia* (Linnaeus). Common summer resident; breeds. Noted regularly in small numbers at all base camps. Cameron's (MS.) earliest spring date on Port Hood Island is May 16, 1941. Our latest autumn date in 1935 was of one at Cape North on September 14. Specimens examined—Cape North: 1 juv. ♀, 1 ad. ♂; August 21, 1936; June 25, 1954.

EASTERN SOLITARY SANDPIPER *Tringa solitaria solitaria* Wilson. Transient. We observed two (one collected) at Cape North on August 26 and four there on September 13. Another was taken at Frizzleton on October 4, 1935. Erskine (MS.) observed six in August, 1953, on St. Paul Island.

EASTERN WILLET *Catoptrophorus semipalmatus semipalmatus* (Gmelin). Local summer resident; breeds. H. R. Webster (*in litt.*) saw Willets on Madame Island in May, 1951, which were paired. Later, on August 6 he saw this species at the mouth of Framboise River. In 1954, we observed two on June 4 on Madame Island, and on July 17 we counted 11 adults there with four flightless young, definitely establishing the breeding of this species on Cape

Breton Island. On July 18 two adults were seen at L'Ardoise and one was noted there on August 1.

GREATER YELLOW-LEGS *Totanus melanoleucus* (Gmelin). Migrant and uncommon summer resident; possibly breeds. In 1954, the writer observed one on Madame Island and one at Baddeck on June 4; one between Baddeck and Middle River on June 10; one at St. Anns, 3 at Jersey Cove, June 11; 5 at St. Anns, 3 at Jersey Cove, July 11. Some of these seemed excited at our approach, suggesting the presence of young. One at Point Michaud on August 3 circled about me for some minutes calling loudly. Cameron (MS.) saw one on July 14, 1945, at Lake of Islands on the interior plateau, which behaved as though it might have had young. After July 15 numbers increase as transients move in. Specimens examined—Dingwall Bay: 1 ♀; August 23, 1935. Mouth of Ingonish River: 1 juv. ♂; October 11, 1924.

LESSER YELLOW-LEGS *Totanus flavipes* (Gmelin). Migrant. Clarke (MS.) observed it at various places on the coast and about ponds in the interior barrens where its behavior was similar to that of birds on the nesting ground. Cameron (MS.) observed several at Ingonish and Pleasant Bay. In 1954, the writer noted it first on July 11 when one was seen on mud flats at St. Anns. In later July it became fairly common.

AMERICAN KNOT *Calidris canutus rufa* (Wilson). Transient. The writer observed it in 1954 at L'Ardoise, Richmond County, where two were present on July 18; 16 on July 28; 15 on August 1. At Point Michaud there were three on August 3. It does not appear to have been noted previously on the island.

PECTORAL SANDPIPER *Erolia melanotos* (Vieillot). Transient. An adult was observed by the writer at Louisburg on July 27, 1954.

WHITE-RUMPED SANDPIPER *Erolia fuscicollis* (Vieillot). Transient. An adult was observed at Dingwall Bay on August 23 and smaller numbers until September 18, 1935. In 1954, eight were present on August 3 at Point Michaud. Specimens examined—Dingwall Bay: 1 ad. ♀, 1 juv. ♂; August 23, 1935.

LEAST SANDPIPER *Erolia minutilla* (Vieillot). Common transient. In 1954, we first recorded it on July 7 after which its numbers increased rapidly.

EASTERN DOWITCHER *Limnodromus griseus griseus* (Gmelin). Transient. In 1935, Gould saw one at Cape North on August 23 and five on September 13. In 1954, the writer observed six at L'Archevesque and 30 at L'Ardoise on July 18. Other observations at Louisburg on July 24(5), 25(1), 26(2); and at L'Ardoise July 28(2); August 1(7), 3(2). Specimen examined—Dingwall Bay: 1 post-juv. ♂; August 23, 1935.

SEMIPALMATED SANDPIPER *Ereunetes pusillus* (Linnaeus). Common transient. In 1954 it was first noted on July 18 (2 at L'Ardoise) after which its numbers rapidly increased along the coast. In 1935 it was noted until September 18 at Cape North. Specimens examined—Dingwall Bay: (2).

SANDERLING *Crocethia alba* (Pallas). Transient. In 1954, four were observed at Point Michaud on August 3. In 1935 at Cape North one was seen on August 28; one on September 7; 25 on September 11; and 150 on September 18. Specimens examined—Dingwall Bay: (1), Cape North (1).

RED PHALAROPE *Phalaropus fulicarius* (Linnaeus). An offshore migrant. White (1891) noted three between Cape North and Cape St. Lawrence on June 13.

NORTHERN PHALAROPE *Lobipes lobatus* (Linnaeus). Migrant along the coast. On August 29, 1935, Gould observed several flocks of phalaropes off Dingwall Bay and collected one which proved to be this species. Whether or not the specimen was preserved is unknown. Townsend (1906) saw several at sea south of Cape Breton Island on August 17, 1905.

GLAUCOUS GULL *Larus hyperboreus hyperboreus* Gunnerus. One was carefully observed by A. W. F. Banfield at Ingonish on March 21, 1947.

GREAT BLACK-BACKED GULL *Larus marinus* Linnaeus. Common; breeds. Probably some winter on the coast. There is a large breeding colony near Louisburg.

HERRING GULL *Larus argentatus smithsonianus* Coues. Common about both salt and fresh water; breeds. Probably some winter. We noted it daily in 1954.

RING-BILLED GULL *Larus delawarensis* Ord. Uncommon visitor. Townsend (1906) saw one at Ingonish in August, 1905. D. B. O. Savile (oral) observed one yearling and two adults at Sugar Loaf (Aspy Bay) on August 17, 1956.

BLACK-HEADED GULL *Larus ridibundus* Linnaeus. Goodwill (MS.) carefully observed one at Cheticamp on November 1, 1952. This species is now known to occur in small numbers on the coast of the peninsula of Nova Scotia in late autumn and winter.

BONAPARTE GULL *Larus philadelphia* (Ord). Uncommon spring and fairly common autumn transient. In 1935 as many as 50 were noted in late August and mid-September at Dingwall Bay. Clarke (MS.) saw it regularly along the National Park coast in August, 1941. In 1954, the writer observed five at Nyanza on June 6. Specimens examined—Dingwall Bay: 1 ad., 2 juv.; August 23-28, 1935.

IVORY GULL *Pagophila eburnea* (Phipps). Casual autumn visitor. Piers (1894) recorded a mounted specimen from Cape Breton Island (no further locality) which was taken on October 15, 1889.

ATLANTIC KITTIWAKE *Rissa tridactyla* (Linnaeus). Migrant. Gould (MS.) recorded three off Dingwall Bay on September 8 and two on September 9, 1935. Bayley (1925) stated that it is of common occurrence in October and November in the vicinity of Hertford Islands. Taverner (MS.) saw a mounted specimen taken there.

COMMON TERN *Sterna hirundo hirundo* Linnaeus. Common summer resident. Breeds. In 1954 the writer visited small breeding colonies at St. Anns, Jersey Cove, and near Baddeck. Specimens examined—Cape North: 1 ad. ♀; August 19, 1935. Dingwall Bay: 1 ad. ♂; August 23, 1935.

ARCTIC TERN *Sterna paradisaea* Pontoppidan. Summer resident, less frequently observed than the Common Tern in the writer's experience. Breeds. In 1954, the writer observed about 20 pairs nesting on small coastal islands near Arichat, saw a number of adults at Petit-de-Grat, and noted several small colonies on islands near Louisburg. Townsend (1906) saw six at Ingonish in August, 1905.

RAZOR-BILLED AUK *Alca torda torda* Linnaeus. Very local breeder and coastal migrant. Bayley (1925) estimated 300 pairs nesting on Ciboux and Hertford islands and stated that they arrive there in early May and depart

toward the end of August. On August 24, 1935, a young bird, still very small and in the downlike juvenal plumage, was collected by V. E. Gould; and on the same date the writer collected an adult male five miles at sea from Dingwall Bay. Specimens examined—Dingwall Bay, 1 juv. ♂; Dingwall Bay (5 miles east) 1 ad. ♂.

ATLANTIC MURRE *Uria aalge aalge* (Pontoppidan). Bayley (1925) stated that probably not more than a dozen pairs of murrelets (sp.) nest on Ciboux and Hertford islands, although he was told that they were much more plentiful in former years. Taverner (MS.) visited these islands in 1929 and identified two individuals, both Atlantic Murrelets.

DOVEKIE *Plautus alle alle* (Linnaeus). Dr. R. M. Anderson (MS.) remarks: "Very abundant all along the coast from Ingonish to North Sydney in middle of October, 1924."

ATLANTIC BLACK GUILLEMOT *Cephus grylle atlantis* Salomonsen. Not uncommon summer and winter resident along the coast; breeds. Bayley (1925) mentions hundreds nesting at Hertford and Ciboux Islands at the time he wrote. In 1935, Gould observed two off Dingwall Bay on August 24, and one there on September 2. He collected the following two specimens. Specimens examined—Dingwall Bay, 1 ad. ♀, 1 ad. unsexed, August 24–September 2, 1935.

ATLANTIC PUFFIN *Fratercula arctica arctica* (Linnaeus). Bayley (1925) stated that at the time he wrote there were certainly a thousand nesting on Hertford and Ciboux Islands. They arrive there during the last week of April or early May, and depart in late August. In 1935, we saw two (one collected) in Dingwall Bay and another there on September 2. Specimens examined—Dingwall Bay (1); Cape North (1).

EASTERN MOURNING DOVE *Zenaidura macroura carolinensis* (Linnaeus). J. M. J[ones] (1870) stated that a specimen collected at Glace Bay was exhibited at the March 8, 1869, meeting of the Nova Scotia Institute of Natural Science. It was collected a short time prior to the meeting but the exact date is not given. Taber (1952) reports one found dead October 28, 1950, at Mabou. A pair of wings in the National Museum were found at Hillsboro, Inverness Co., on November 24, 1950, by John W. Cameron who saw another at Port Hood on December 10, 1956.

BLACK-BILLED CUCKOO *Coccyzus erythrophthalmus* (Wilson). Rare summer resident; breeds. R. J. d'Entremont observed two near Thibeaupville, Richmond Co., on July 30, 1954, one of which he collected. It proved to be a female in laying condition. Cameron (oral) saw one on Port Hood Island on July 17, 1941. *C. americanus* is listed by Dwight (1887) but probably the bird seen was *C. erythrophthalmus*. Specimen examined—Thibeaupville: 1 ad. ♀; July 30, 1954.

GREAT HORNED OWL *Bubo virginianus* subsp. Not uncommon permanent resident; breeds. The writer collected one near Cape North on August 26, 1935. In 1954, two young just capable of flight were seen on June 20 at Baddeck Forks. Specimen examined—Cape North: 1 ad. ♀; August 26, 1935. This specimen approaches *heterocnemis* in its dark coloration, but is strongly reddish as in *virginianus*. Additional material is needed to determine more closely the affinities of the Cape Breton Island population.

SNOWY OWL *Nyctea scandiaca* (Linnaeus). Cameron (oral) has observed this owl on Port Hood Island in winter.

NORTHERN BARRED OWL *Strix varia varia* Barton. Moderately common

permanent resident. In 1935 we recorded individuals of this owl at Cape North on September 2 and 23 and at Frizzleton on October 1, 5, 6, and 14. Goodwill (MS.) noted one on Kidston Island, off Baddeck, on November 3, 1946, and August 31, 1947. Specimens examined—Cape North: 1 ♂, 1 ♀; September 2-23, 1935.

SAW-WHET OWL *Aegolius acadicus acadicus* (Gmelin). Resident. Macoun and Macoun (1909) record a pair at Sydney on June 12, 1902. In the evening dusk of September 1, 1935, while the writer was engaged in setting small mammal traps, one of these small owls alighted in an alder near by and watched with obvious curiosity for fully a minute.

EASTERN NIGHTHAWK *Chordeiles minor minor* (Forster). Not uncommon summer resident; breeds. Cameron's (oral) earliest spring record on Port Hood Island is May 31, 1940. In 1935, we noted it until September 7 at Cape North. It was recorded by Dwight (1887) and mentioned by Allen (1891). Specimens examined—Cape North: 2 juv.; September 7, 1935. Margaree Forks: 1 ad. ♂; July 5, 1954.

CHIMNEY SWIFT *Chaetura pelagica* (Linnaeus). Not uncommon summer resident throughout the island. The writer recorded a total of 91 in the period June 5 to July 27, 1954. Cameron's earliest spring record at Port Hood Island is May 16, 1939.

RUBY-THROATED HUMMINGBIRD *Archilochus colubris* (Linnaeus). Uncommon summer resident. The writer noted a total of nine between June 6 and July 14, 1954. Specimen examined—Baddeck: 1 ad. ♂; June 17, 1954.

EASTERN BELTED KINGFISHER *Megasceryle alcyon alcyon* (Linnaeus). Common summer resident; breeds. In 1954 the writer observed a total of 104 from June 4 to August 3. Seasonally Cameron first noted it on May 1, 1938 and 1940, and we in 1935 saw it as late as October 3 at Frizzleton. A nest was seen at Dingwall on June 24, 1954. Specimen examined—Cape North: 1 ♂; August 28, 1935.

NORTHERN FLICKER *Colaptes auratus luteus* Bangs. Common summer resident; breeds. Spring arrival at Port Hood Island, April 14, 1938 (Cameron). In 1935 we noted it seasonally as late as October 21 at St. Peters. Specimen examined—Baddeck: 1 ad. ♂; July 10, 1954.

NORTHERN PILEATED WOODPECKER *Dryocopus pileatus abieticola* (Bangs). One was seen by Gould on October 22, 1935, at St. Peters. Clarke (MS.) in 1941 saw the work of this species at Long Lake as also did Cameron (MS.) near Pleasant Bay in 1945. Bond (MS.) saw two near Baddeck in July, 1941. The writer in 1954 observed two near Baddeck on June 19, collected one on July 16; and saw one near Grande Anse on August 3. R. J. d'Entremont saw one at Baddeck Forks on July 10, 1954. Specimen examined—Baddeck: 1 ad. ♂; July 16, 1954.

YELLOW-BELLIED SAPSUCKER *Sphyrapicus varius varius* (Linnaeus). Uncommon summer resident; breeds. Macoun and Macoun (1909) considered it a common summer resident at Sydney, stated that it was first seen on May 7, and that eggs were far advanced by June 15. In 1954, we found a few individuals in the Baddeck area and noted a nest with young on July 10. It appears to be locally distributed on the island. Specimens examined—Baddeck: 2 ad. ♂; June 7-29, 1954.

EASTERN HAIRY WOODPECKER *Dendrocopos villosus villosus* (Linnaeus). Fairly common permanent resident in wooded parts of the island. Specimens examined—Cape North: 4 ♂; August 20–September 11, 1955; June 25, 1954. Cleveland: 1 juv. ♂; July 23, 1954. All are unquestionably *villosus*. They show very little tendency toward *septentrionalis* and none at all toward the Newfoundland race *terraenovae*.

NORTHERN DOWNY WOODPECKER *Dendrocopos pubescens medianus* (Swainson). Fairly common permanent resident in woodland throughout the island. Specimens examined—Cape North: 1 ad. ♂, 1 ad. ♀; September 23, 1935; June 23, 1954.

ARCTIC THREE-TOED WOODPECKER *Picoides arcticus* (Swainson). Uncommon permanent resident in heavier coniferous forests of the island. Allen (1891) observed one in June, 1890, in the Bras d'Or region. In 1935 we saw two near Frizzleton on October 5 and one was seen at St. Peters on October 17, 19, 20, 21, and 22. In 1954, we recorded one near Baddeck on June 7, two on June 30; one near Cleveland, Richmond Co., on July 23. Cameron (MS.) noted one near Ingonish in July, 1945. Specimen examined—St. Peters: 1 ad. ♀; October 29, 1935. Baddeck: 1 ad. ♂, 1 ad. ♀; June 30, 1954. The Baddeck male listed above is slightly albinistic on dorsum and nape.

EASTERN KINGBIRD *Tyrannus tyrannus* (Linnaeus). Summer resident frequenting tall shrubbery and trees of farms, roadsides, stream edges, and similar open country. In 1954, we observed small numbers at Nyanza, English-town, Baddeck Forks, Cape North, Whycocomagh, Margaree Forks, Scotsville, Strathlorne, and Cleveland. Earliest spring record at Port Hood Island is May 17, 1941 (Cameron).

[EASTERN PHOEBE *Sayornis phoebe* (Latham). Hypothetical. A sight record of a pair at Sydney (Macoun and Macoun, 1909) requires confirmation.]

YELLOW-BELLIED FLYCATCHER *Empidonax flaviventris* (Baird and Baird). Common summer resident in damper, mossy woodland often where alders are present. In 1954, small numbers were seen or heard almost daily in suitable habitat throughout the island. A nest, discovered by d'Entremont near Baddeck on June 30, 1954, was located in moss on the forest floor and contained four eggs. In 1935 our latest observation was at Cape North on August 31. Clarke (MS.) stated that five were seen in the Park in 1945. Specimens examined—Thibeaupville: 1 ad. ♂, 2 ad. ♀, 1 unsexed; July 29–31, 1954. Baddeck: 2 ad. ♂, 1 ad. ♀; June 7–30, 1954. Whycocomagh: 1 ad. ♂; June 10, 1954.

ALDER FLYCATCHER *Empidonax traillii traillii* (Audubon). Rather uncommon in alders and similar tall shrubbery throughout the island. In 1954 we observed it from Port Hawkesbury to Cape North but always in small numbers. Our latest autumn date was September 5, 1935, at Cape North. Specimens examined—Cape North: 1 unsexed juv.; August 27, 1935. Baddeck: 3 ad. ♂, 1 ad. ♀, 1 ad. unsexed; June 12–July 13, 1954.

LEAST FLYCATCHER *Empidonax minimus* (Baird and Baird). Fairly common summer resident of more open woodland and wood edges; breeds. In 1935, one was collected at Cape North on August 27. In 1954, we found it locally common near Baddeck where as many as eight were noted in a day and in Aspy Valley where as many as five were observed in a day. A nest on a horizontal branch of a beech near Baddeck was nearly completed on June 19.

Specimens examined—Cape North: 1 unsexed juv.; August 27, 1935. Baddeck: 3 ad. ♂, 1 ad. ♀, 1 ad. unsexed; June 12–July 13, 1954.

EASTERN WOOD PEWEE *Contopus virens* (Linnaeus). Uncommon summer resident; breeds. It does not seem to have been recorded previously. In 1954, the writer observed several near Baddeck, one near Whycocomagh, one at Middle River, and one near Scotsville. A female collected near Baddeck on June 29 had an egg in the oviduct. Goodwill (MS.) observed one near Baddeck on June 22 and 29, 1947. Specimens examined—Baddeck: 1 ad. ♂, 1 ad. ♀; June 3–29, 1954.

OLIVE-SIDED FLYCATCHER *Nuttallornis borealis* (Swainson). Fairly common summer resident in woodland throughout the island. In 1935 it was last noted on August 29 at Cape North. In 1954 we observed it on most dates during June and July. Specimens examined—Cape North: 1 ad. ♂; June 24, 1954.

HORNED LARK *Eremophila alpestris* subsp. Uncommon summer resident. Cameron (MS.) observed a flock of adults and young near Cheticamp on August 1, 1945. The writer in 1954 saw two near Mabou on July 14, and on July 28 noted nine young and adults, at L'Ardoise. Goodwill (MS.) saw one near North Sydney on May 28, 1946. Probably the breeding form is the Prairie Horned Lark *Eremophila alpestris praticola* but no specimens are available to determine this. The Northern Horned Lark *E. a. alpestris* probably is a migrant; and perhaps a winter resident.

TREE SWALLOW *Iridoprocne bicolor* (Vieillot). Summer resident. Latest autumn record August 18, 1935, at Cape North.

BANK SWALLOW *Riparia riparia riparia* (Linnaeus). Common summer resident. Nesting colonies seen at Baddeck, St. Anns, Cape North, Dingwall, Whycocomagh, and Margaree Harbour. Last seen on August 28, 1935, at Cape North.

BARN SWALLOW *Hirundo rustica erythrogaster* Boddaert. Common summer resident particularly about farms. Latest autumn record, September 11, 1935, at Cape North. A pair noted on St. Paul Island (Erskine MS.). Specimens examined—Thibauville: 3 ad. ♂, 1 ad. ♀, 1 juv. ♂; July 31, 1954.

NORTHERN CLIFF SWALLOW *Petrochelidon pyrrhonota pyrrhonota* (Vieillot). An uncommon, local summer resident. Noted by the writer at Baddeck, Nyanza, St. Anns, Orangedale, Sydney, River Inhabitants, Thibauville, and Cape North. Breeds. Latest autumn date, August 18. Specimens examined—Thibauville: 2 ad. ♂, 1 ad. ♀; July 29, 1954.

NEWFOUNDLAND CANADA JAY *Perisoreus canadensis sanfordi* Oberholser. Not uncommon permanent resident of coniferous forests throughout the island. Breeds. Specimens collected—Frizzleton: 3 ad. ♂, 1 ad. ♀; October 4–14, 1935. Baddeck: 1 ad. ♂, 1 ad. ♀, 1 juv. ♂; July 12–14, 1954. Cleveland: 1 ad. ♂; July 23, 1954.

NORTHERN BLUE JAY *Cyanocitta cristata bromia* Oberholser. Common permanent resident. Breeds. Young just out of the nest were seen on June 29, 1954, near Baddeck. On July 1 an adult was seen there carrying in its bill a nestling bird the species of which could not be determined. Specimens examined—Cape North: 2 ♂; September 13, 1935; June 23, 1954. Baddeck: 1 ♀; June 16, 1954.

NORTHERN RAVEN *Corvus corax principalis* Ridgway. Common permanent resident. Breeds. First flying young noted June 19, 1954, near Baddeck. One with a young bird in its beak was hotly pursued by several adult Bronzed Grackles as it flew low over Baddeck on June 8. On July 5, five were observed eating dead alewives on Margaree River. Erskine (MS.) noted a pair on St. Paul Island.

EASTERN CROW *Corvus brachyrhynchos brachyrhynchos* Brehm. Common permanent resident. Frequently seen by Erskine (MS.) on St. Paul Island.

BLACK-CAPPED CHICKADEE *Parus atricapillus atricapillus* Linnaeus. Fairly common permanent resident. Specimens examined—Cape North: 1 ad. ♀, 1 juv. unsexed; June 26, 1954, August 28, 1935. Baddeck: 3 ad. ♂; June 17-19, 1954. Frizzleton: 1 ad. ♂; September 30, 1935.

ACADIAN BOREAL CHICKADEE *Parus hudsonicus littoralis* Bryant. Common permanent resident. In August, 1953, Erskine (MS.) found it abundant on St. Paul Island. Specimens examined (8)—Cape North, Baddeck, Frizzleton, Sporting Mountain.

WHITE-BREASTED NUTHATCH *Sitta carolinensis cookei* Oberholser. In 1935, one was seen in the vicinity of Cape North on August 18 and 28, and September 21; and two on September 22. Two were seen at Frizzleton on September 30 and several about mid-October. In 1954 we saw only one: at Baddeck Forks on June 12.

RED-BREASTED NUTHATCH *Sitta canadensis* Linnaeus. Permanent resident, its numbers fluctuating from year to year. In 1935, we noted it in small numbers in the vicinity of Cape North and near Frizzleton (where as many as 12 were seen on September 30). In 1954, we observed only five singles, all in June in the vicinity of Baddeck. Erskine (MS.) heard it often and saw it once in August, 1953, on St. Paul Island. Specimens examined (2)—Cape North, Whycocomagh.

BROWN CREEPER *Certhia familiaris americana* Bonaparte. Uncommon permanent resident. We observed it, mostly in singles, at Cape North, Frizzleton, Baddeck, Baddeck Forks, Grande Anse, St. Peters, and Thibeaupville. A family group was seen near Baddeck on July 12, 1954. Specimens examined (7)—Frizzleton, Baddeck, Baddeck Forks, and Thibeaupville.

EASTERN WINTER WREN *Troglodytes troglodytes hiemalis* Vieillot. In 1954 we observed it in the vicinity of Baddeck on June 7(2), 9(2), 15(1), 19(1), 30(3); July 13(3), 16(1); near Whycocomagh, June 10(1); Cleveland, July 23(3); Louisburg, July 26(3); Thibeaupville, July 30(1), 31(2); Grande Anse, August 1(1), 2(3). Erskine (MS.) saw one on St. Paul Island. Specimens examined (5)—Baddeck, Cleveland, Grande Anse.

CATBIRD *Dumetella carolinensis* (Linnaeus). Rare summer resident. On June 22, 1954, I collected a singing male in alders along the Aspy River near Cape North. On July 5, 1954, one was observed at the outlet of Lake Ainslie near Scotsville. Apparently these are the only records. Specimen examined (1)—Cape North.

EASTERN ROBIN *Turdus migratorius migratorius* Linnaeus. Common in spring, summer, and autumn; breeds. Specimens examined (5)—Englishtown, Sporting Mountain, Cleveland.

BLACK-BACKED ROBIN *Turdus migratorius nigrideus* Aldrich and Nutt.

Migrant. One was collected near Frizzleton on September 30, 1935, by V. E. Gould. Specimen examined (1)—Frizzleton.

EASTERN HERMIT THRUSH *Hylocichla guttata faxoni* Bangs and Penard. Common summer resident. In 1935 our latest record was of one still partly in juvenal plumage taken at Frizzleton on October 1. Specimens examined (10)—Baddeck, Strathlorne, Thibeaupville, Englishtown, Sporting Mountain, Frizzleton.

OLIVE-BACKED THRUSH *Hylocichla ustulata swainsoni* (Tschudi). Common summer resident. In 1935, our latest observation was on September 30. On St. Paul Island in August, 1953, it was common (Erskine MS.). Specimens examined—Sporting Mountain (3), Cape North (7), Grande Anse (2), Baddeck (5).

GRAY-CHEEKED THRUSH *Hylocichla minima* ssp. The writer heard two calling on French Mountain on June 20 where Bond (MS.) noted the species on July 6, 1949. It is mentioned by Allen (1895) as having been observed (no further data) in Cape Breton by Frank Bolles. Goodwill (MS.) observed two on Kidston Island on August 4, 1946. No specimens are available but probably the resident population is *bicknelli*.

EASTERN GOLDEN-CROWNED KINGLET *Regulus satrapa satrapa* Lichtenstein. Fairly common summer resident; probably winters. Erskine (MS.) saw a 'flock' on St. Paul Island in August, 1953. Specimens examined—Baddeck (3), Ingonish (1).

EASTERN RUBY-CROWNED KINGLET *Regulus calendula calendula* (Linnaeus). Common summer resident. Specimens examined—Baddeck (3), Cape North (1), Frizzleton (1).

AMERICAN PIPIT *Anthus spinoletta rubescens* (Tunstall). Migrant. In 1935, we observed 12 near Frizzleton on October 8.

CEDAR WAXWING *Bombycilla cedrorum* Vieillot. Uncommon summer resident. In 1935 we noted a total of 15 between August 21 and September 18 at Cape North. In 1954 between June 22 and July 23 we observed 16 at several points in Cape Breton. Erskine (MS.) found it common on St. Paul Island in August, 1953.

NORTHERN SHRIKE *Lanius excubitor borealis* Vieillot. C. R. Harte saw this species at Sydney on March 8, and April 13 and 18, 1902 (Macoun and Macoun 1909).

EUROPEAN STARLING *Sturnus vulgaris vulgaris* Linnaeus. A nest was located near Port Hawkesbury on June 20, 1934, and the species was said to have made its first appearance in that vicinity in summer of 1932 (Gross, 1937). In 1945, Cameron (MS.) found it only fairly common about the settled regions of Cape Breton Highlands National Park. Goodwill (MS.) in 1946 observed the species regularly near Baddeck while he was there between June 10 and November 16. In 1954 we saw it regularly in most settled parts of the island; nests at Nyanza and near Cape North.

BLUE-HEADED VIREO *Vireo solitarius solitarius* (Wilson). Fairly common summer resident. In 1935 we last observed it on September 13. Specimens examined—Baddeck (5), Cape North (4).

RED-EYED VIREO *Vireo olivaceus* (Linnaeus). Common summer resident. Specimens examined—Cape North (7); Sporting Mountain (1); Whycocomagh (1).

BLACK AND WHITE WARBLER *Mniotilta varia* (Linnaeus). Uncommon summer resident. We observed a total of 17 from June 8 to July 23, 1954. Specimens examined—Baddeck (3), Cape North (2), Lake Ainslie (1).

TENNESSEE WARBLER *Vermivora peregrina* (Wilson). Uncommon summer resident. Clarke (MS.) states that Tufts recorded two in the National Park. In 1954, the writer noted eight in the Aspy Valley and others on subsequent dates. It was seen also on Madame Island; near Strathlorne, on Sporting Mountain, near Sydney, and near Louisburg. Specimen examined—Sporting Mountain (1).

NASHVILLE WARBLER *Vermivora ruficapilla ruficapilla* (Wilson). Not uncommon summer resident. In 1954 we observed a total of 28 between June 3 and July 23. In 1935 our latest observation was of one collected on September 18. Specimen examined—Cape North (1).

PARULA WARBLER *Parula americana* (Linnaeus). Rather common summer resident. A total of 92 were recorded in 1954 between June 3 and July 30. Specimens examined—Baddeck (3).

NEWFOUNDLAND YELLOW WARBLER *Dendroica petechia amnicola* Batchelder. Common summer resident. In 1935 our latest observation was of one (collected) on September 10. Specimens examined—Cape North (4). Of the four specimens listed above, three were taken in the breeding season. They are somewhat intermediate between *amnicola* and *aestiva* but are nearer to the former.

MAGNOLIA WARBLER *Dendroica magnolia* (Wilson). Very common summer resident. Our latest observation date was September 11 when three were seen. Common on St. Paul Island in August, 1953, according to Erskine (MS.). Specimens examined—Cape North (4), Baddeck (3), Sporting Mountain (2), Thibeaupville (1), Grande Anse (1).

CAPE MAY WARBLER *Dendroica tigrina* (Gmelin). One was collected by R. W. Tufts (MS.) in the Park on June 20, 1941. Bond (MS.) found a male near Cheticamp in July, 1949.

BLACK-THROATED BLUE WARBLER *Dendroica caerulescens caerulescens* (Gmelin). Rather local summer resident, usually about mature hardwoods. In 1954 we recorded it as follows: June 4, one near Johnstown; June 9, one near Baddeck; June 10, four males near Whycocomagh. Singles were seen near Baddeck on June 12, 15, 17, 18, July 10 and 16; Cape North, June 22, 25, and 26. Latest autumn date September 13, 1935, at Cape North. Specimens examined—Baddeck (3), Cape North (2).

MYRTLE WARBLER *Dendroica coronata coronata* (Linnaeus). Very common summer resident. In 1935 our latest observation was of one at St. Peters on October 20. Specimens examined—Cape North (6), Baddeck (3), Grande Anse (1).

BLACK-THROATED GREEN WARBLER *Dendroica virens virens* (Gmelin). Common summer resident in coniferous forest or mixed wood. Our latest autumn record is of one at Frizzleton on October 1, 1935. Specimens examined—Baddeck (12), Cape North (3), Thibeaupville (1), Whycocomagh (1), Madame Island (1), Cleveland (1).

BLACKBURNIAN WARBLER *Dendroica fusca* (Müller). Fairly common summer resident. Specimens examined—Cape North (3), Baddeck (3).

BAY-BREASTED WARBLER *Dendroica castanea* (Wilson). Uncommon summer resident. In 1954, we observed three at Port Hawkesbury on June 3 and near Baddeck on June 4(1), 30(2); July 1(1), 12(1), 14(1); Englishtown, June 14(3); Cape North, June 21(2), 26(2); south side of Lake Ainslie, July 5(5, one carrying food); Strathlorne, July 6(2). One was seen on June 4, 1890, by Allen (1891). Specimens examined—Englishtown (2), Baddeck (1).

BLACK-POLLED WARBLER *Dendroica striata* (Forster). Local summer resident. In 1954, several were heard and seen in coniferous woods on French Mountain on June 20; four singing males in spruce bogs near Louisburg on July 26. Three singing males near Baddeck on June 7 were probably migrants for they were not observed later. Our latest autumn observation in 1935 was of one collected on September 18 at Cape North. Erskine (MS.) found it common and still singing August 10-17, 1953, on St. Paul Island.

YELLOW PALM WARBLER *Dendroica palmarum hypochrysea* Ridgway. Uncommon summer resident. In 1954 we found it at Madame Island, June 4(1), 18(1); near Strathlorne July 6(2), 7(2), 8(1), 14(4); Sporting Mountain, July 19(5), 20(2), 22(1); Louisburg, July 26(2); and Thibeuville, July 30(3), 31(1). Our latest autumn date in 1935 was October 5 when one was collected at Frizzleton. Specimens examined—Strathlorne (1), Thibeuville (1), Frizzleton (1).

NORTHERN OVEN-BIRD *Seiurus aurocapillus aurocapillus* (Linnaeus). Locally fairly common summer resident. In 1954, we recorded a total of 37 between June 4 and July 26. In 1935, our latest autumn date was September 24 at Cape North. Specimens examined—Cape North (5), Baddeck (3), Whycocomagh (1).

NEWFOUNDLAND OVEN-BIRD *Seiurus aurocapillus furvior* Batchelder. Migrant. The writer secured a specimen of this race at Cape North on August 30, 1953. Specimen examined—Cape North (1).

NORTHERN WATER-THRUSH *Seiurus noveboracensis noveboracensis* (Gmelin). Uncommon summer resident. In 1954 we observed a total of 18 at well distributed localities. In 1935 our latest autumn record was of one on August 31 at Cape North. On St. Paul Island, Erskine (MS.) noted it frequently August 10-17, 1953. Specimens examined—Cape North (3), Baddeck Forks (2).

MOURNING WARBLER *Opororis philadelphia* (Wilson). Common summer resident. In 1954 we noted it almost daily in June and July, eight being the largest number seen in any one day. An adult carrying food was observed near Baddeck on July 18. Young out of the nest were first seen on July 29. Our latest date in 1935 was September 6 when one was taken at Cape North. Erskine (MS.) found it "frequent" on St. Paul Island in August, 1953. Specimens examined—Baddeck (4), Cape North (2), Whycocomagh (1), Thibeuville (1), Grande Anse (1).

NORTHERN YELLOW-THROAT *Geothlypis trichas brachidactyla* (Swainson). Common summer resident. Latest autumn date in 1935 was October 5 when one was noted at Frizzleton. Specimens examined—Strathlorne (9), Grande Anse (4), Baddeck (3), Sporting Mountain (2), Thibeuville (1), Orangedale (1), Cape North (1).

WILSON WARBLER *Wilsonia pusilla pusilla* (Wilson). "One was seen on the Clyburn on August 12, 1941" (Clarke, MS.). Goodwill (MS.) noted one

near North Sydney on June 1, 1946. Dwight (1887) observed it, probably near Baddeck, in early August.

CANADA WARBLER *Wilsonia canadensis* (Linnaeus). R. J. d'Entremont collected an adult male near Grande Anse on August 3, 1954. Clarke (MS.) states that the species was "seen up the Clyburn on August 12-13, 1941." Goodwill (MS.) saw one at Baddeck on September 8, 1946. Specimen examined—Grande Anse (1).

NORTHERN AMERICAN REDSTART *Setophaga ruticilla tricolora* (Müller). Common summer resident. Latest autumn date, September 21, 1935, when one was seen at Cape North. Specimens examined—Baddeck (2), Cape North (2), Thibeaupville (1), Englishtown (1).

ENGLISH SPARROW *Passer domesticus domesticus* (Linnaeus). According to Coues (1890) this species made its first appearance in Cape Breton during November 1889, coincidentally with the completion of the Cape Breton Railroad. By 1905, Townsend (1906) found it common in August and early September at Hawkesbury, St. Peters, Sydney, Baddeck, and Englishtown. It has now, of course, spread over the entire island where settlement exists.

BOBOLINK *Dolichonyx oryzivorus* (Linnaeus). Local summer resident. In 1935, we observed a total of about 45 at such points as Johnstown, Baddeck, Nyanza, Middle River Valley, Margaree, Lake Ainslie near Strathlorne, and near Cape North. Our latest autumn date in 1935 was September 5 on which date three were seen at Cape North. Specimen examined—Cape North (1).

EASTERN MEADOWLARK *Sturnella magna magna* (Linnaeus). According to Tufts (MS.) one was found dead at Donkin on January 21, 1941.

EASTERN RED-WING *Agelaius phoeniceus phoeniceus* (Linnaeus). In as much as this species was not recorded by Dwight (1887), Allen (1891, 1895), or Townsend (1906) one wonders if it is a recent arrival on the island. In 1954 we observed it at Florence, Baddeck, Nyanza, Strathlorne, Mabou, Grande Anse, and Cleveland. At Scotsville about 45 were observed on July 5. Specimens examined—Strathlorne (6).

RUSTY BLACKBIRD *Euphagus carolinus nigrans* Burleigh and Peters. Local summer resident; breeds. In 1954, we observed a total of 47 between June 5 and August 2 at several points on the island. In 1935 it was last noted on October 6 when one was seen at Frizzleton. On July 6, 1954, first flying young were observed at Strathlorne. Specimens examined—Baddeck (4), Strathlorne (2), Sporting Mountain (1).

BRONZED GRACKLE *Quiscalus quiscula versicolor* Vieillot. Common summer resident. Breeds. In 1954, we noted it in the vicinity of most towns and villages throughout the island including Cape North. Two nests were seen at Baddeck, one on June 9, the other on June 15. About 125 birds were observed on July 9 at Strathlorne. As is the case in Prince Edward Island (Godfrey, 1954) the Bronzed Grackle seems to be a recent arrival on Cape Breton Island for it was not seen by Dwight (1887), Allen (1891, 1895), or Townsend (1906). Specimens examined—Baddeck (1), Strathlorne (1).

EASTERN COWBIRD *Molothrus ater ater* (Boddaert). Two males and a female were observed at Port Hood on April 25, 1954, by A. W. Cameron (oral).

ROSE-BREASTED GROSBEAK *Pheucticus ludovicianus* (Linnaeus). Rare summer resident. The writer observed a male in mature hardwood near East

Margaree on July 9, 1954, and heard another near Baddeck on June 19. The species was noted near Whycocomagh and Margaree Forks by Bond (MS.). Goodwill (MS.) saw one on Kidston Island, off Baddeck, on August 31, 1947.

DICKCISSEL *Spiza americana* (Gmelin). A specimen, now in Nova Scotia Museum of Science, was killed by a car near Sydney on December 3, 1929. It had been feeding with English Sparrows in the middle of a road (Smith, 1938).

EASTERN PURPLE FINCH *Carpodacus purpureus purpureus* (Gmelin). Common summer resident. Possibly some winter. Specimens examined—Baddeck (6), Cape North (2).

NEWFOUNDLAND PINE GROSBEAK *Pinicola enucleator eschatosa* Oberholser. Uncommon summer resident, sometimes common in winter. Breeds. In 1954, we observed it as follows: Baddeck, June 7(2), 9(2), 16(4), 17(1), 19(1), July 16(2); near Pleasant Bay, June 20(2); French Mountain, June 20(1); Cape North, June 22(1), 23(1), 24(1), 26(1); near Louisburg, July 26(1); Thibeaupville, July 29(2). Specimens examined—Baddeck (8), Cape North (1), Frizzleton (2), Thibeaupville (1).

REDPOLL *Acanthis* sp. On November 3, 1946, Goodwill (MS.) saw ten on Kidston Island, off Baddeck, and in Baddeck on November 7 of that year he saw five. Probably they were Common Redpolls *Acanthis flammea flammea*. Harte (Macoun and Macoun, 1909) intimated that it was probably common at Sydney in winter and stated that he saw a flock on December 10, 1901.

NORTHERN PINE SISKIN *Spinus pinus pinus* (Wilson). In 1954, we saw small flocks irregularly in June and July at Englishtown, Baddeck, Cape North, Main-a-Dieu, and Grande Anse. In 1935 it was very common in the vicinity of Cape North in late August and early September and small numbers were seen also at Frizzleton and St. Peters. Specimens examined—Cape North (5).

EASTERN GOLDFINCH *Spinus tristis tristis* (Linnaeus). Fairly common summer resident. Breeds. Possibly some winter. We observed it at many points throughout the island. Macoun and Macoun (1909) state that it breeds. Cameron (MS.) located a nest with one egg on the Aspy meadows July 23, 1945. Specimens examined—Cape North (4).

RED CROSSBILL *Loxia curvirostra* subsp. Macoun and Macoun (1909) state that it was common at Baddeck and Margaree in July, 1898. Townsend (1906) found it abundant in August 1905.

WHITE-WINGED CROSSBILL *Loxia leucoptera leucoptera* Gmelin. In 1935, we observed two on September 27 and nine on September 2 at Cape North. In 1954, the writer noted two on August 3 at Grande Anse. Townsend (1906) found it abundant in August, 1905. Goodwill (MS.) observed small numbers several times in the Baddeck area between October 20 and November 12, 1946. Common on St. Paul Island in August 1953 (Erskine MS.).

EASTERN SAVANNAH SPARROW *Passerculus sandwichensis savanna* (Wilson). Common summer resident about hay meadows, pastures, marsh edges, and similar grassy open places throughout the island. Breeds. A female was taken at Cape North with an egg in the oviduct on June 25, 1954. Specimens examined—Grande Anse (5), Frizzleton (1), Cape North (6), Thibeaupville (7), Margaree Harbour (3), south side Lake Ainslie (1), Orangedale (1).

LABRADOR SAVANNAH SPARROW *Passerculus sandwichensis labradorius* Howe. Migrant. The writer collected a female at Cape North on September 5, 1935. Specimen examined—Cape North (1).

ACADIAN SHARP-TAILED SPARROW *Ammospiza caudacuta subvirgata* (Dwight). Local summer resident in salt and brackish marshes. In 1954 we found it at Cape North, June 20(2), 22(1); Indian Bay, June 29(6), July 12(5), 15(4), 18(1); Strathlorne July 6(5), 9(5); Margaree Harbour, July 7(2); Whycomagh, July 2(8); Margaree River, July 3(10); Mabou, July 10(7), Johnstown, July 24(3). Macoun and Macoun (1909) state that a nest was taken near Baddeck on July 26, 1898.

[VESPER SPARROW *Poocetes gramineus* (Gmelin). Hypothetical. Allen (1895) lists this species without any details.]

SLATE-COLORED JUNCO *Junco hyemalis hyemalis* Linnaeus. Very common summer resident. Probably winters. Breeds. A nest was located at Thibaultville with three eggs on July 31, 1954. Specimens examined—Baddeck (3), Englishtown (1), Sporting Mountain (2).

EASTERN TREE SPARROW *Spizella arborea arborea* (Wilson). Migrant and probably winter resident. Goodwill (MS.) observed two on November 3 and three on November 8, 1946, at Baddeck. Adequate observation at the appropriate season would doubtless show it to be a common migrant and winter resident.

EASTERN CHIPPING SPARROW *Spizella passerina passerina* (Bechstein). Fairly common summer resident. In 1935 our latest autumn record was on October 11 when 20 were seen at Frizzleton. In 1946 Goodwill (MS.) saw two near Baddeck on October 13. Specimens examined—Cape North (2).

[FIELD SPARROW *Spizella pusilla* Wilson. Hypothetical. Harte's statement (Macoun and Macoun, 1909) that a few were seen on June 8, 1902, at Sydney is probably due to confusion with some other species.]

WHITE-THROATED SPARROW *Zonotrichia albicollis* (Gmelin). Common summer resident. Breeds. Specimens examined—Cape North (3), Cleveland (1), Englishtown (1), Grande Anse (3), Baddeck (3), Frizzleton (1).

EASTERN FOX SPARROW *Passerella iliaca iliaca* (Merram). Spring and summer transient. Macoun and Macoun (1909) mention a specimen collected at Sydney on May 18, 1902. In 1935 we noted small numbers from September 22 to October 1 at Cape North; October 6 to 14 at Frizzleton; and on October 21 one was seen at St. Peters. Specimens examined—Frizzleton (2).

LINCOLN SPARROW *Melospiza lincolnii lincolnii* (Audubon). Not uncommon summer resident. In 1954, we observed it near Baddeck on June 9(2), 30(4); July 1(1), 4(1), July 12(1), 13(1), 14(1), 18(2); south side of Lake Ainslie, July 5(3); Cape North, June 21(5), 22(5), 23(6), 24(4), 25(3); Strathlorne, July 6(4), 7(6), 8(5), 9(2); Sporting Mountain, July 20(2); Cleveland, July 23(1); Louisburg, July 26(3); Thibaultville, July 29(1), 30(3), 31(3); Grande Anse, August 2(3). In 1935 our latest autumn date was September 30 at Frizzleton.

SOUTHERN SWAMP SPARROW *Melospiza georgiana georgiana* (Latham). Fairly common summer resident about freshwater marshes and similar wet places. Breeds. A nest was found at Sydney on May 25, 1901 (Macoun and Macoun, 1909). In 1935 we noted the species until October 8 on which date several were present at Frizzleton. Specimens examined—Strathlorne (8), Cape

North (2). These specimens are intermediate between *georgiana* and *ericrypta* but average slightly nearer the former.

NORTHERN SWAMP SPARROW *Melospiza georgiana ericrypta* Oberholser. Migrant. The writer took single specimens at Cape North on September 5 and 11, 1935, and at Frizzleton on October 6. Specimens examined—Cape North (2), Frizzleton (1).

EASTERN SONG SPARROW *Melospiza melodia melodia* (Wilson). Very common summer resident. Breeds. Probably a few winter as in other parts of Nova Scotia. Specimens examined—Cape North (10), Ingonish Centre (1), Thibeaupville (3), Baddeck (1), Orangedale (2), Grande Anse (2), Strathlorne (3), Frizzleton (1).

SNOW BUNTING *Plectrophenax nivalis nivalis* (Linnaeus). Migrant. Probably winters. We observed ten near Port Hawkesbury on October 26, 1935.

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THE DISTRIBUTION OF THE WESTERN PAINTED TURTLE IN MANITOBA

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IN 1851 Richardson commented on the geographical distribution of reptiles east of the Rocky Mountains and recorded turtles "as disappearing beyond the 51st, at the south end of Lake Winnipeg. There the *Emys geographica* of Le Seur . . . occurs." Seton (1918) says that "probably this refers to . . . *Chrysemys marginata bellii*" (now *C. picta bellii*). This latter observation appears to be correct, as to the writer's knowledge only two turtles occur in Manitoba: the Western Painted Turtle *Chrysemys picta bellii* Gray and the Snapping Turtle *Chelydra serpentina serpentina* Linnaeus. The assumption is further strengthened by the fact that Richardson also mentions another turtle "with a flexible neck" which he thought was probably the Snapping Turtle.

Since this first record the known range of the turtle in Manitoba has been mentioned in three separate articles. In 1918 Seton recorded it from the Red River near Winnipeg, and from Carberry, Boissevain, Riding Mountain, and Austin. Criddle (1919), in a short note, recorded it from Rice Lake near Onah; and Logier and Toner (1955) brought together the above records and added one new one, the Bloodvein River region of Lake Winnipeg.

During some preliminary studies of this turtle the writer became impressed by the fact that so little was known of its range. Consequently, prominent naturalists throughout Manitoba were consulted and a compilation of the records provided by them, in addition to the writer's own records, was begun. The following list and map (Figure 1) should serve to greatly enlarge our knowledge of the turtle's distribution in Manitoba.

The records listed below are new to the literature and unless marked otherwise are the result of personal communication; the abbreviations for museum specimens are: NMC—National Museum of Canada, and MNHM—Manitoba Natural History Museum.

NEW MANITOBA RECORDS FOR THE PAINTED TURTLE

RED RIVER SYSTEM. Lockport (J. J. Keleher), Rat River (G. W. Malaher), Red River (G. W. Malaher), Sandilands (NMC 1847), Seine River (G. W. Malaher), and Winnipeg (R. Sutton).

ASSINIBOINE RIVER SYSTEM. Assiniboine River (J. Serafin and W. J. Goodey through G. W. Malaher), Assiniboine River south of Portage la Prairie (S. M. Boyachek), Birtle (R. D. Bird), Brandon (NMC 50), Douglas Lakes (S. Criddle, R. D. Bird), Jackfish Lake—an oxbow of the Assiniboine River twenty miles south of Melbourne Junction (R. Allen), Minnedosa River near junction with Assiniboine River (C. D. Bird), road between Onanole and south gate of Riding Mountain National Park (MNHM), Ormond Creek near Winnipeg (R. Sutton), St. Lazare (R. D. Bird), slough six miles north of Melbourne (R. Allen), Virden (Mrs. D. B. Sparling), Virden near Assiniboine River (Mrs. D. B. Sparling).

SOURIS RIVER SYSTEM. Antler Creek (J. Serafin through G. W. Malaher, R. Sutton), Antler Creek at junction with Souris River (C. Tillenius), Graham Creek (J. V. Parker), Jackson Creek (J. V. Parker), highway south of Melita (J. V. Parker), North Antler Creek (J. V. Parker), Pipestone Creek (J. Serafin through G. W. Malaher), Souris River (H. Guttman, J. Serafin, and W. J. Goodey through G. W. Malaher; R. Sutton), Souris River near junction with Assiniboine (J. B. Wallis), Souris River south of Nesbit (C. D. Bird), South Antler Creek (J. V. Parker), Treesbank (NMC 961), lakes throughout Turtle Mountain (M. S. Colquhoun).

PEMBINA RIVER SYSTEM. Near Morden (Mrs. D. B. Sparling), Pembina River (R. Sutton).

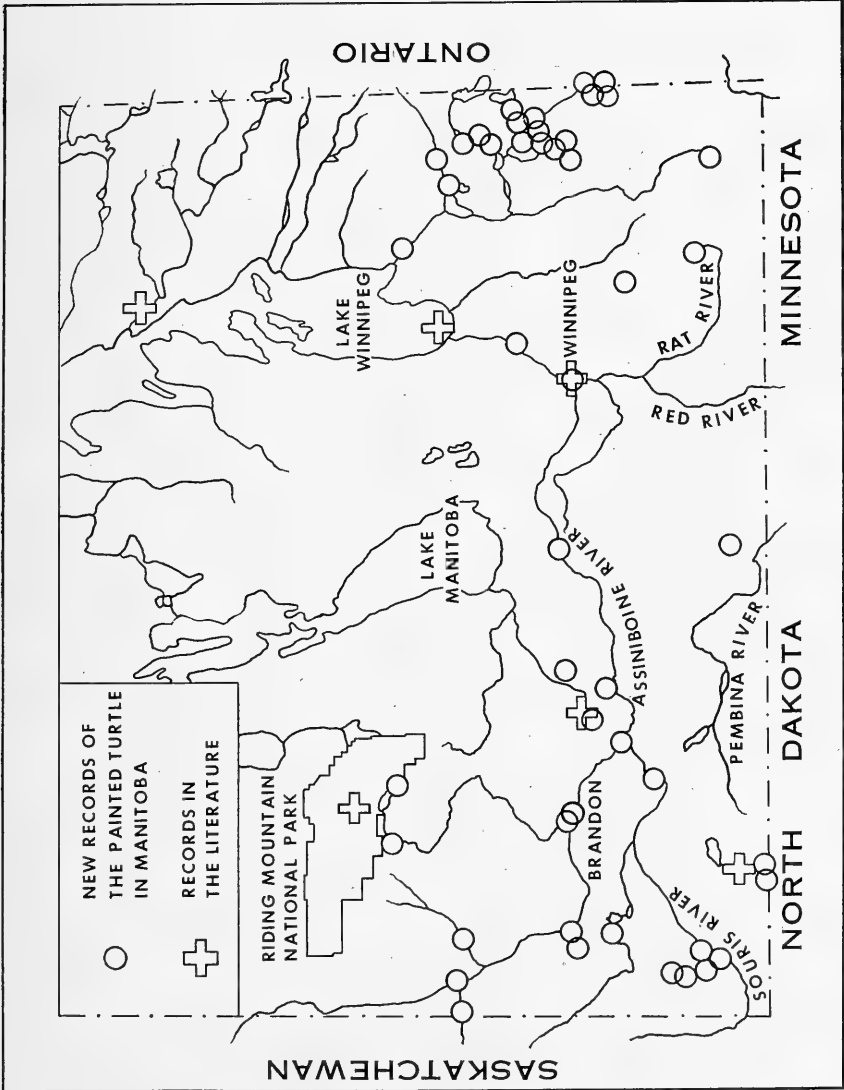


FIGURE 1. Map of southern Manitoba showing the known range of the Western Painted Turtle *Chrysemys picta bellii* Gray.

BROKENHEAD RIVER SYSTEM. Brokenhead River (C. Tillenius), near Richer (A. McLeod).

WINNIPEG RIVER SYSTEM. Barren Lake (G. W. Malaher), Betula Lake (H. D. Whellams, J. C. Ritchie, C. D. Bird), Big Whiteshell Lake (C. Tillenius), Brereton Lake (A. H. Shortt, C. Tillenius, H. D. Whellams), Cabin Lake (G. W. Malaher, C. D. Bird), Caddy Lake (H. D. Whellams), Camp Lake (H. D. Whellams), Falcon Lake (G. W. Malaher, H. D. Whellams), George Lake (H. D. Whellams, R. Sutton), Green Lake (R. Sutton), High Lake (H. D. Whellams, E. Fisher through R. Sutton, NMC 2145), Jessica Lake (A. H. Shortt, H. D. Whellams, C. Tillenius, C. D. Bird), Lac Du Bonnet (H. D. Whellams), Lyons Lake (H. D. Whellams), Oiseau River (H. D. Whellams), Pointe Du Bois (Mrs. C. Whitmore through R. Sutton), Red Rock Lake (A. H. Shortt, C. Tillenius, H. D. Whellams, C. D. Bird), Rennie River (C. Tillenius), Rice Lake (H. D. Whellams), near Silver Falls (R. Sutton), Star Lake (G. W. Malaher, G. Butler), War Eagle Lake (H. D. Whellams), West Hawk Lake (G. W. Malaher, H. D. Whellams), White Lake (A. H. Shortt, H. D. Whellams, D. Reimer, C. D. Bird), Whitemouth Lake (H. D. Whellams), Whitemouth River (G. W. Malaher, C. Tillenius, H. D. Whellams), Whiteshell River (C. Tillenius, H. D. Whellams), Whiteshell River near Lone Island Lake (R. Sutton), Williams Lake (R. Sutton), Winnipeg River (H. D. Whellams).

In commenting on the turtle's range in Manitoba Seton (1918) said that "it is of general distribution in the southwest quarter of Manitoba, but is unknown at Shoal Lake or anywhere on the east side of Lake Winnipeg." From the writer's studies it has become apparent that the turtle occurs in greatest abundance in the southeast corner of Manitoba and in lesser numbers to the west.

In the eastern part of the province lakes and streams are very numerous and most of them connect with the Winnipeg River system. Turtles have been found to be generally abundant throughout this area.

The range in the central and western part of the province is restricted to the Red River and its tributaries, the Rat, the Seine, the Assiniboine, the Souris, the Minnedosa, and the Qu'Appelle rivers. The species may also be frequently found in sloughs and lakes at the headwaters of these water bodies.

Within the above areas the Western Painted Turtle is most commonly met with in backwaters, sloughs, quiet streams, and sheltered bays where the water is shallow, the bottom is soft, and there is abundant aquatic vegetation. Deep, cold lakes and rapidly moving streams appear to be generally avoided.

The early (1851) report of Richardson that turtles seem to disappear beyond the 51st parallel is corroborated by the above records. The reason for this restriction in range is believed to be due to the requirement of long heat for the hatching of the eggs. Eggs are generally laid in the latter part of June and according to Breckenridge (1944) may have an incubation period of from 92 to 140 days. In fall the turtles burrow into the soft muddy bottoms of the lakes and streams which they inhabit and they are thus able to survive extreme

degrees of cold that prevail above ground. Their eggs, however, are laid in comparatively shallow, covered, holes on dry land and hence any eggs which had not received enough warmth to hatch during the summer and early fall would be frozen during the winter. In more southerly areas these eggs stand a chance of overwintering (see Hartweg, 1944 and 1946; Carr, 1952; Carl, 1944; Cahn, 1938; and Thacker, 1924) but in the northerly areas they are prevented from doing so by the longer exposure to cold and because of the greater minimum temperatures.

Acknowledgments are extended to all the above-mentioned people who helped in the compilation of the new records. In addition I would like to thank Sherman Bleakney of the National Museum of Canada and Richard Sutton of the Manitoba Natural History Museum for furnishing records of this species of turtle from their respective Museums.

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EXPLANATORY NOTE

The information at the bottom of the front cover, known as a bibliographical strip, is presented in this concise form to facilitate the arrangement of periodicals and the compilation of citations. Its use brings the *CANADIAN FIELD-NATURALIST* into complete conformity with the recommendations on the layout of periodicals of the International Organization for Standardization (ISO). Canada is a signatory to these recommendations.

CHRISTMAS BIRD CENSUS — 1957

Edited by W. Earl Godfrey

St. John's, Nfld. (City of St. John's and check points at nearby Torbay and Cape Spear).—Dec. 26, 1957; 8.30 a.m. to 3.30 p.m.; temp. 18° to 32°; wind NW. Total party hours, 22 (16 on foot, 6 by car); total party miles, 92 (14 on foot, 78 by car).

Common Loon, 1; Oldsquaw, 2; Common Eider, 30; Glaucous Gull, 3; Iceland Gull, 33; Great Black-backed Gull, 50; Herring Gull, 688; Dovekie, 22; Black Guillemot, 9; Rock Dove, 285; Mourning Dove, 5; Boreal Owl, 1; Belted Kingfisher, 1; Yellow-shafted Flicker, 3; Common Raven, 6; Common Crow, 42; Black-capped Chickadee, 18; Boreal Chickadee, 6; Am. Robin, 1; Golden-crowned Kinglet, 10; Northern Shrike, 1; Starling, 1,670; Myrtle Warbler, 1; House Sparrow, 586; Purple Finch, 22; Pine Grosbeak, 3; Common Redpoll, 188; Red Crossbill, 7; Fox Sparrow, 1. Total 29 species; 3,685 individuals.

Stuart Peters, Florence Peters, Jack Saunders, Joyce Saunders, Harold Horwood, Charles Richardson, Leslie M. Tuck, (compiler), Wayne L. Tuck, Mrs. A. G. Gosling, Tom Bergerud, Wyona Bergerud.

Cole Harbour-Chezzetcook, N.S. (7½-mile radius centered on Mineville; Eastern Shore Highway and surrounding area between Dartmouth and Porters Lake; Cole Harbour, Lawrencetown, Wedge Island, Seaforth and Chezzetcook).—Dec. 22, 1957; 7.45 a.m. to 4.45 p.m.; early fog then 9/10 cloud; temp. 45° to 50°; wind NNW, 0 to 25 m.p.h.; ground wet, free of snow, all water open, heavy swell at sea. Fourteen observers in 6 parties. Total party hours, 47 (28 on foot, 19 by car); total party miles, 149 (35 on foot, 114 by car).

Common Loon, 3; Red-necked Grebe, 2; Horned Grebe, 28; Great Cormorant, 2; Great Blue Heron, 1; Canada Goose, 430; Black Duck, 420; Pintail, 3; Common Goldeneye, 30; Bufflehead, 21; Oldsquaw, 31; Common Eider, 5; White-winged Scoter, 4; Surf Scoter, 11; Common Scoter, 11; Common Merganser, 3; Red-breasted Merganser, 53; Hawk (Buteo), 1; Ruffed Grouse, 2; Gray Partridge, 7; Common Snipe, 1; Purple Sandpiper, 26; Sanderling, 20; Great Black-backed Gull, 115; Herring Gull, 805; Ring-billed Gull, 7; Black-headed Gull, 14; Common Murre, 1; Thick-billed Murre, 1; Dovekie, 8; Black Guillemot, 1; Rock Dove, 15; Mourning Dove, 1; Hairy Woodpecker, 2; Downy Woodpecker, 4; Black-backed Three-toed Woodpecker, 1; Horned Lark, 5; Gray Jay, 17; Blue Jay, 42; Common Raven, 23; Common Crow, 150; Black-capped Chickadee, 125; Boreal Chickadee, 19; White-breasted Nuthatch, 4; Brown Creeper, 2; Golden-crowned Kinglet, 43; Starling, 665; Palm Warbler, 3; House Sparrow, 510; Brown-headed Cowbird, 350; Evening Grosbeak, 1; Common Redpoll, 54; Pine Siskin, 23; Am. Goldfinch, 145; White-winged Crossbill, 17; Savannah Sparrow, 20; Slate-colored Junco, 255; Tree Sparrow, 21; White-throated Sparrow, 9; Swamp Sparrow, 5; Song Sparrow, 34; Lapland Longspur, 2; Snow Bunting, 4. Total, 63 species; about 4,698 individuals. (Seen in area Dec. 29, Virginia Rail (immature), 1; Northern Shrike, 1; Meadowlark, 1).

C. R. K. Allen, John Comer, Miss Ethel Crathorne, Fred Dobson, Mrs. Phyllis Dobson, J. K. S. Kirkaldy, I. A. Macpherson, L. B. Macpherson (compiler), I. A. McCarter, Willett J. Mills, H. P. Moffatt, T. F. T. Morland, J. C. Morrow and Mrs. Franklyn White (Nova Scotia Bird Society).

Halifax, N.S. (7½-mile radius centered just north of Henry Lake on Old Sambro Road. Includes City, Harbour, Northwest Arm and roads to Herring Cove, Sambro, Prospect Bay and Timberlea).—Dec. 26, 1957; 7.45 a.m. to 5.00 p.m.; mostly cloudy; temp. 24° to 33°; wind SE, 5 to 25 m.p.h.; ground bare and frozen, thin ice on some ponds and inlets, heavy swell at sea. Twenty observers, 10 in 6 parties, 10 at 9 feeding stations. Total party hours, 38 plus feeder-watching time (19 on foot, 17 by car, 2 by boat); total party miles, 101 (20 on foot, 76 by car, 5 by boat).

Common Loon, 6; Red-necked Grebe, 6; Horned Grebe, 6; Cormorant (probably Great), 35; Common Goldeneye, 5; Oldsquaw, 9; White-winged Scoter, 9; Common Scoter, 10; Red-breasted Merganser, 3; Sharp-shinned Hawk, 1; Rough-legged Hawk, 1; Purple Sandpiper, 1; Glaucous Gull, 1; Iceland Gull, 3; Great Black-backed Gull, 580; Herring Gull, 5,700; Ring-billed Gull, 7; Black-headed Gull, 8; Thick-billed Murre, 1; Dovekie, 6; Rock Dove, 500; Hairy Woodpecker, 6; Downy Woodpecker,

5; Horned Lark, 15; Gray Jay, 13; Blue Jay, 28; Common Raven, 14; Common Crow, 134; Black-capped Chickadee, 98; Boreal Chickadee, 15; White-breasted Nuthatch, 6; Red-breasted Nuthatch, 2; Brown Creeper, 1; Am. Robin, 8; Golden-crowned Kinglet, 17; Northern Shrike, 2; Starling, 5,100; Palm Warbler, 1; Yellow-breasted Chat, 1; House Sparrow, 1,200; Brown-headed Cowbird, 3; Evening Grosbeak, 31; Purple Finch, 2; Pine Grosbeak, 10; Common Redpoll, 60; Pine Siskin, 17; Am. Goldfinch, 76; White-winged Crossbill, 10; Savannah Sparrow, 6; Slate-colored Junco, 110; Tree Sparrow, 7; Song Sparrow, 11. Total, 52 species; about 13,907 individuals.

C. R. K. Allen, Mrs. G. P. Backman, Mrs. E. A. Bell, John Comer, A. D. M. and Mrs. Curry, Fred Dobson, Mrs. John Doull, Miss Alice Falkenham, Mrs. H. G. Grant, S. A. Grimm, J. K. S. Kirkaldy, I. A. Macpherson, L. B. Macpherson (compiler), J. A. McCarter, Willett J. Mills, H. P. Moffatt, T. F. T. Morland, Mrs. C. L. Torey and Mrs. V. J. Wynne (Nova Scotia Bird Society).

West Middle Sable, N.S. (From Matthews Lake and Hemeon Head to 1 mi. N of Sable River and from Sable River to East Sable River and Johnson Pond. Mixed woods, ocean shore, sand beach, sheltered brackish water and scattered rural community).—Dec. 24, 1957; 7.20 a.m. to 5 p.m.; mostly sunny, clouds 15-75%; temp. 40° to 50°; wind SW to W, 5-20 m.p.h.; no frost, ice or snow. Four observers in 4 parties (2 stationary). Total party hours, 15½ (8½ on foot, 3 by car, 4 by bicycle); total party miles, 49 (14 on foot, 20 by car, 15 by bicycle).

Common Loon, 1; Horned Grebe, 2; Great Cormorant, 54; Canada Goose, 652; Black Duck, 173; Greater Scaup, 25; Common Goldeneye, 2; Bufflehead, 15; Oldsquaw, 1; Common Eider, 3; Common Scoter, 40; Ruffed Grouse, 3; Great Black-backed Gull, 61; Herring Gull, 1,010; Dovekie, 1; Hairy Woodpecker, 2; Downy Woodpecker, 1; Horned Lark, 1; Gray Jay, 6; Blue Jay, 4; Common Raven, 3; Common Crow, 81; Black-capped Chickadee, 7; Boreal Chickadee, 3; Am. Robin, 1; Starling, 14; House Sparrow, 1; Am. Goldfinch, 9; Slate-colored Junco, 34; Tree Sparrow, 8; White-throated Sparrow, 2; Song Sparrow, 3; Lapland Longspur, 1. Total, 33 species; 2,224 individuals. (Also seen in area in count period: Mallard, Goshawk, Great Horned Owl, White-breasted Nuthatch, Brown Thrasher, Baltimore Oriole, Chipping Sparrow, Swamp Sparrow).

Harrison F. Lewis (compiler), Laura N. Lewis, Mrs. Cecil Thompson, Harold F. Tufts.

Wolfville, N.S. (Within a radius of approximately ten miles of Acadia University, west to Kentville; south to Black River; east to Avonport; and north to Pereau).—Dec. 26, 1957; partly clear, partly overcast; temp. 20° at start, 34° later; ground bare; ponds mostly open; visibility excellent; light southwest wind. 11 observers in five parties (two at bird tables). Total party hours, 19; total party miles, 190 (174 by car, 16 on foot).

Canada Goose, 110; Black Duck, 210; Common Goldeneye, 17; Goshawk, 1; Redtailed Hawk, 5; Rough-legged Hawk, 1; Pigeon Hawk, 1; Sparrow Hawk, 1; Bald Eagle, 13 (8 ad. and 7 im.); Ruffed Grouse, 3; Ring-necked Pheasant, 8 (3 males, 5 females); Common Snipe, 1; Great Black-backed Gull, 200; Herring Gull, 524; Rock Dove, 21; Hairy Woodpecker, 2; Downy Woodpecker, 2; Horned Lark, 7; Blue Jay, 59; Common Raven, 118; Common Crow, 620; Black-capped Chickadee, 33; Boreal Chickadee, 9; White-breasted Nuthatch, 3; Red-breasted Nuthatch, 1; Brown Creeper, 1; Robin, 42; Golden-crowned Kinglet, 13; Starling, 1,203; House Sparrow, 490; Redwinged Blackbird, 1; Evening Grosbeak, 15; Purple Finch, 6; Pine Grosbeak, 1; Common Redpoll, 23; American Goldfinch, 5; White-winged Crossbill, 6; Savannah Sparrow, 10; Slate-colored Junco, 200; Tree Sparrow, 5; White-throated Sparrow, 1; Song Sparrow, 7. Total, 42 species; 3,999 individuals.

Joan Bromley, J. S. Erskine, Rachel Erskine, Mary Forbes, Rupert Haley, Ralph Mosher, Eric Mullen, Peter Smith, Christopher Thurrott, Virginia Thurrott, R. W. Tufts (compiler).

Port Elgin, N.B. (Baie Verte, Port Elgin, Hardy, Woodside, Shemogue; all within 7½-mi. radius of school at Woodside; open fields and apple orchards bordering highway 30%, salt-water marshes 30%, beach at Baie Verte 30%, coniferous forest 10%).—Dec. 28, 1957; 8.30 a.m. to 4.30 p.m.; overcast, light snow and drizzle in a.m.; temp. 33° to 35°; wind NW, 5-15 m.p.h.; ground unfrozen, covered with one inch of wet snow; all fresh-water areas open. Four observers in two parties. Total party hours, 28 (14 on foot, 14 by car); total party miles, 85 (20 on foot, 65 by car).

Common Goldeneye, 32; Red-breasted Merganser, 1; Ring-necked Pheasant, 1; Herring Gull, 28; Blue Jay, 26; Common Raven, 2; Common Crow, 11; Black-capped Chickadee, 6; Northern Shrike, 1; Starling, 302 (200 est., 102); House Sparrow, 140 (130 est., 10); Common Redpoll, 4; Savannah Sparrow, 1; Tree Sparrow, 5; Snow Bunting, 100 (90 est., 10). Total, 15 species; about 660 individuals.

Don McPhail, Ed Lowe, Albert Flemming, C. O. Bartlett (compiler).

Riverview Heights, N.B. (Streets and roads in Riverview. Woods surrounding Riverview. 1 mile west on Highway 29 to bridge crossing Petitcodiac River. 5 miles east on Highway 29 and 3 miles south on Turtle Creek Road on which periodical checks of the surrounding woods were made).—Dec. 29, 1957; 11.15 a.m. to 2.45 p.m.; temp. 38° to 28°; wind SE, 8 m.p.h.; mild, ground muddy, a few patches of light snow, overcast. 4 observers in 1 party. Total party hours, 7 hr. 45 min. (45 minutes on foot, 7 hr. by car); total party miles, 9 (1 on foot, 8 by car).

Black Duck, 119; Ruffed Grouse, 1; Ring-necked Pheasant, 2; Great Black-backed Gull, 61; Herring Gull, 285; Downy Woodpecker, 1; Gray Jay, 4; Blue Jay, 8; Common Crow, 2 and 3; Mockingbird, 1; Starling, 35 and 30; House Sparrow, 5 and 35; Common Grackle, 1; Pine Grosbeak, 1; Common Redpoll, 12; Tree Sparrow, 2; Chipping Sparrow, 1. Total, 17 species; 604 individuals.

Roger MacGregor (compiler), Harry MacGregor, Mrs. Harry MacGregor, Scott MacGregor.

Saint John, N.B. ($7\frac{1}{2}$ -mile radius including Saint John, Lancaster, Rothesay and lower Saint John and Kennebecasis river valleys. Part covered 20% sea coast, 70% city and residential and 10% coniferous and mixed woods. Ground bare).—Dec. 30, 1957; 7.30 a.m. to 5.00 p.m.; temp. 30° to 40°; wind NW, 10-12 m.p.h. 8 observers in 6 parties. Total party hours, 25 (17 on foot, 8 by car); total party miles, 65 (21 on foot, 44 by car).

Common Loon, 1; Horned Grebe, 2; Black Duck, 16; Common Goldeneye, 35; Goshawk, 1; Ruffed Grouse, 4; Glaucous Gull, 2; Iceland Gull, 3; Great Black-backed Gull, 1950±; Herring Gull, 9661±; Rock Dove, 103+; Hairy Woodpecker, 3; Downy Woodpecker, 8; Blue Jay, 5; Common Raven, 21; Common Crow, 217; Black-capped Chickadee, 59; Red-breasted Nuthatch, 3; Brown Creeper, 1; Am. Robin, 2; Golden-crowned Kinglet, 3; Starling, 425+; Nashville Warbler, 1; House Sparrow, 395+; Evening Grosbeak, 2; Pine Grosbeak, 13; Common Redpoll, 20; Pine Siskin, 2; Slate-colored Junco, 35; Tree Sparrow, 31; White-throated Sparrow, 1. Total, 33 species; about 13,051 individuals. (Seen in area during Christmas season: 1 Catbird, 1 Myrtle Warbler and numerous Gray Jays. Nashville Warbler has been coming to a feeding station at Renforth since mid-November).

David Christie, Mrs. C. S. Christie, Miss Jane Hazen, Donald MacDougall, Stuart MacFarlane, Mrs. Ashley J. Smith, W. Austin Squires (compiler), Murray Watters.

Grand'Mere, Que. (All birds observed at feeding stations in wooded area on outskirts of town. Country rolling and covered with young hardwood stand).—Dec. 26, 1957; 8 a.m. to 5 p.m. One observer.

Hairy Woodpecker, 2; Downy Woodpecker, 3; Black-capped Chickadee, 10; White-breasted Nuthatch, 3; Red-breasted Nuthatch, 2; Song Sparrow, 1. Total, 6 species; 16 individuals. (Seen in area during count period: Pine Grosbeak, House Sparrow, Starling, Crow, Pileated Woodpecker).

R. E. Kirkpatrick.

Hudson Heights, Que. (Como to Hudson Heights, 7 to 8 miles, S.W. side Lake of Two Mountains and inland 2 to 5 miles; 5% residential; 35% woodland; 60% fields and farmland; water frozen. Includes feeding stations of Whitlock Sanctuary).—Dec. 28, 1957; 8 a.m. to 4 p.m.; partly cloudy; temp. 20° to 25°; wind E 10 m.p.h.; no snow on ground; streams and Lake of Two Mountains mostly frozen. 15 observers in 7 parties. Total party hours, 37½ (26 on foot, 4 by car, 7½ by feeders); total party miles, 90 (42 on foot, 48 by car).

Rough-legged Hawk, 1; Ruffed Grouse, 5; Pileated Woodpecker, 3; Hairy Woodpecker, 18; Downy Woodpecker, 28; Black-backed Three-toed Woodpecker, 1; Blue Jay, 41; Common Crow, 1; Black-capped Chickadee, 207; White-breasted Nuthatch, 35; Red-breasted Nuthatch, 4; Golden-crowned Kinglet, 11; Starling, 21; House Sparrow, 111; Redwinged Blackbird, 1; Common Grackle, 1; Evening Grosbeak, 221; Purple Finch, 20; Pine Grosbeak, 30; Common Redpoll, 199; Am. Goldfinch, 4; Slate-colored Junco, 8; Tree Sparrow, 37. Total, 23 species; 1008 individuals.

(Seen in area in count period: Herring Gull, Sparrow Hawk, Horned Owl, Brown Creeper).

Mr. and Mrs. A. I. Bryan, Misses A. and M. Clarke, R. Cundill, R. Farren, Mr. and Mrs. G. A. Golden (compiler), A. Kelly, Mr. and Mrs. R. Lepingwell, Mrs. D. Macaulay, D. Macaulay, Jr., H. Marpole, Mrs. R. Wright.

Lennoxville, Que. (Open fields and hedgerows along two miles of Magog River and 101 miles of roads close to mixed second-growth woods; 4 m. woods from mature hemlock to scrub, totaling 1 sq. m.; 3 sq. m. of Lake Massawippi; 11 feeding stations in Lennoxville and N. Hatley; all within a circle with critical 15 m. diameter extending from Magog power dam to just beyond Lennoxville).—Dec. 28, 1957; 7.45 a.m. to 3.45 p.m.; (7 observers only for full day); cloudy; temp. 30° to 16°; wind nil 8 a.m. to 5; 3 m.p.h. at 4 p.m., av. 3.9 m.p.h.; ground with 1 inch or more of snow where protected, mostly bare; Lake Magog frozen (no timing of these obs.). 20 observers in 3 to 5 parties plus 11 stationary observers at feeders (maximum numbers used). Total party hours, 22 (16 on foot, 6 by car); total party miles, 119 (18 on foot, 101 by car).

Black Duck, 2; Common Goldeneye, 100+; Goldeneye (sp.) 50+; Common Merganser, 104+; Ruffed Grouse, 6; Herring Gull, 11; Pileated Woodpecker, 1; Hairy Woodpecker, 12; Downy Woodpecker, 7; Blue Jay, 37; Black-capped Chickadee, 83; White-breasted Nuthatch, 13; Northern Shrike, 1; Starling, 58; House Sparrow, 104; Redwinged Blackbird, 1; Evening Grosbeak, 22; Pine Grosbeak, 8; Tree Sparrow, 12. (Seen in area Dec. 24: 5 Barron's Goldeneyes; Dec. 29: 7 Barron's Goldeneyes). Total, 18 plus species; 632 plus individuals.

A. P. Campbell, C. Coleman, H. Doheny, J. E. Freeman, Mrs. J. E. Freeman, R. Hart, K. R. Lane, A. N. Langford (compiler), Miss E. LeBaron, F. G. LeBaron, Miss J. LeBaron, G. H. Moffat, Mrs. F. Molnar, D. C. Patriquin, B. W. Patton, D. Pollock, Mrs. G. P. St. Pierre, P. St. Pierre, W. Sarasin, R. Shannon, plus 11 part-time observers at feeders.

Montreal, Que. (Mount Royal, Lasalle, Thorn Hill, Strathmore, Cartierville, Laval des Rapides, Ahuntsic, St. Helen's Island, Nun's Island, Goat Island, Heron Island, south shore St. Lawrence River from Mercier Bridge to Jacques Cartier Bridge, and north shore from Dorval to Verdun).—Dec. 21, 1957; 8 a.m. to 4.10 p.m., cloudy and squally; temp. 46° to 38°; wind SW, 15-25 m.p.h.; no snow and all fresh water unfrozen. 22 observers in 9 parties. Total party hours, 58 (38 on foot, 18 by car, 2 by boat); total party miles, 122 (38 on foot, 78 by car, 7 by boat).

Double-crested Cormorant, 1; Mallard, 25; Black Duck, 732; Pintail, 48; Am. Widgeon, 33; Greater Scaup, 6; Common Goldeneye, 466; Common Merganser, 66; Rough-legged Hawk, 2; Ruffed Grouse, 1; Ring-necked Pheasant, 12; Glaucous Gull, 12; Iceland Gull, 7; Great Black-backed Gull, 23; Herring Gull, 617; Ring-billed Gull, 85; Screech Owl, 1; Yellow-shafted Flicker, 4; Pileated Woodpecker, 1; Hairy Woodpecker, 7; Downy Woodpecker, 6; Common Crow, 4; Black-capped Chickadee, 112; White-breasted Nuthatch, 7; Brown Creeper, 19; Am. Robin, 1; Starling, 254; House Sparrow, 230; Pine Grosbeak, 1; Common Redpoll, 59; Am. Goldfinch, 6. Total, 31 species; 2,848 individuals.

Dr. W. F. Black, Mrs. H. E. Chalk, J. D. Delafield, Delisle Garneau, Dr. L. Grahame, E. Hawkins, Miss G. Hibbard, Dr. A. Hickey, J. Howes, A. W. B. Kelly, A. R. Lepingwell, J. K. Lowther, Mrs. J. K. Lowther, I. A. McLaren (compiler), Miss K. Milroy, Hon. Justice G. H. Montgomery, John Montgomery, J. A. Rolland, D. Ryan, Dr. D. E. Sergeant, Dr. J. Summerby, Miss Joan Thornton (Prov. Quebec Soc. for the Protection of Birds).

Quebec, Que. (Ste. Foy to Quebec bridge, Quebec seaport to Island of Orleans bridge, Plains of Abraham, Charlesbourg, Orsainville and Quebec Zoological Garden; town suburbs 14%; fields 25%; coniferous forests 12%; deciduous woods 5%; mixed woodlands 29%; shores 15%).—Dec. 26, 1957; 7.00 a.m. to 4.10 p.m.; overcast, heavy snow p.m. followed by rain; temp. 28° to 35°; wind NE, 3-8 m.p.h.; 3-12 inches of snow on ground; streams open and very few icefields on St. Lawrence River. 25 observers in 6 parties. Total party hours, 33 (30 on foot, 3 by car); total party miles, 73 (37 on foot, 36 by car).

Common Goldeneye, 4; Common Merganser, 6; Ruffed Grouse, 9; Iceland Gull, 2; Great Black-backed Gull, 2; Herring Gull, 32; Ring-billed Gull, 1; Great Horned Owl, 1; Barred Owl, 1; Hairy Woodpecker, 8; Downy Woodpecker, 2; Blue Jay, 16; Common Crow, 2; Black-capped Chickadee, 61; White-breasted Nuthatch, 3; Red-breasted Nuthatch, 1; Northern Shrike, 1; Starling, 200; House Sparrow, 945; Red-winged Blackbird, 1; Evening Grosbeak, 13; Pine Grosbeak, 16; Common Redpoll, 6;

Song Sparrow, 1. Total, 24 species; 1,334 individuals. (Seen in area: Dec. 31, 1 Gray Jay).

Benoît Asselin, Georgette Beaupré, Denis Bouchard, Guy Boucher, Pierrette Bouffard, Jacques Cayouette, Raymond Cayouette (compiler), Claude Dumais, Rolland Dumais, André Fortin, Marie-Claude Guimont, François Hamel, Jean Huot, Ronald Lepage, Louis Lemieux, Louis-A. Lord, Hélène Marceau, Gaston Moisan, Mathilde Morency, Michel Poulin, André Robert, Jean-Marc Robert, François Soucy, René St-Laurent, Henri Talbot (Club des Ornithologues, Quebec).

Bancroft, Ont. (Town of Bancroft, South on Highway 28 to Paudash Lake, Deciduous woods 30%; spruce bogs 30%; town 20%; pasture 20%).—Dec. 24, 1957; 8 a.m. to 4.15 p.m.; temp. 30° to 25°; wind SW, gusts to 40 m.p.h.; dull and stormy in a.m., clearing p.m.; very mild, snow all melted, lakes open. 1 observer. Total party hours, 8½ (5 on foot, 3 by car); total party miles, 73 (5 on foot, 68 by car).

Ruffed Grouse, 2; Hairy Woodpecker, 8; Downy Woodpecker, 2; Blue Jay, 3; Common Raven, 1; Black-capped Chickadee, 32; White-breasted Nuthatch, 3; Red-breasted Nuthatch, 6; Brown Creeper, 1; Golden-crowned Kinglet, 8; Starling, 22; House Sparrow, 75; Common Redpoll, 30. Total, 13 species; 188 individuals. (Robin seen at feeding station on Dec. 16 and 17).

Earl Stark (Toronto Ornith. Club).

Barrie, Ont. (Dec. 28, 1957; temp. 40°; wind light E veering to W; no snow, Kempenfeldt Bay open, Little Lake frozen. 20 observers in 5 cars. Total party hours, 30; total party miles, 226 (10½ on foot, 215½ by car).

Red-necked Grebe, 2; Horned Grebe, 1; Pied-billed Grebe, 3; Common Goldeneye, 1; Sparrow Hawk, 1; Ruffed Grouse, 5; Ring-necked Pheasant, 1; Herring Gull, 35; Ring-billed Gull, 12; Great Horned Owl, 1; Pileated Woodpecker, 7; Hairy Woodpecker, 7; Downy Woodpecker, 15; Blue Jay, 36; Common Crow, 4; Black-capped Chickadee, 157; White-breasted Nuthatch, 12; Red-breasted Nuthatch, 1; Brown Creeper, 2; Golden-crowned Kinglet, 1; Northern Shrike, 6; Starling, 259; English Sparrow, 160; Cardinal, 3; Evening Grosbeak, 37; Pine Grosbeak, 72; Redpoll, 207; Am. Goldfinch, 1; Slate-colored Junco, 12; Tree Sparrow, 5. Totals, 30 species; 1,066 individuals.

Miss A. M. Hughes (Secretary, Brereton Field Naturalists' Club).

Bobeageon, Burnt River, Fenelon Falls and Sturgeon Lake, Ont. (Open farmland 57%; woods, chiefly coniferous 31%; open water 2%; village 10%).—Dec. 22, 1957; 7.05 a.m. to 4.10 p.m.; chiefly cloudy a.m., clear late p.m.; temp. 37° to 41°; wind NW in a.m.; light (ground bare). 2 observers in 1 party. Total party hours, 9 (2½ on foot, 6½ by car); total party miles, 74 (8 on foot, 66 by car).

Common Goldeneye, 1; Red-tailed Hawk, 1; Ruffed Grouse, 8; Pileated Woodpecker, 1; Hairy Woodpecker, 7; Downy Woodpecker, 2; Blue Jay, 2; Black-capped Chickadee, 45; White-breasted Nuthatch, 2; Evening Grosbeak, 1; Common Redpoll, 47; Tree Sparrow, 6. Total, 12 species; about 123 individuals.

David Calvert, E. W. Calvert (compiler).

Brockville, Ont. (That area enclosed by 7½-mile radius circle centered on post office, Brockville. 20% of area is open water; 50% open farmland; 20% deciduous woodland; 7% coniferous woodland; 1½% marsh; 1½% urban).—Dec. 29, 1957; 8 a.m. to 4.30 p.m.; temp. 30° to 38°; wind SW, 10 to 25 m.p.h. 21 observers in 9 parties. Total party hours, 69 (42 on foot, 27 by car); total party miles, 384 (58 on foot, 326 by car).

Common Loon, 2; Greater Scaup, 35; Common Goldeneye, 206; Common Merganser, 30; Goshawk, 1; Rough-legged Hawk, 2; Sparrow Hawk, 1; Ruffed Grouse, 24; Gray Partridge, 5; Iceland Gull, 3; Great Black-backed Gull, 9; Herring Gull, 132; Ring-billed Gull, 46; Great Horned Owl, 1; Pileated Woodpecker, 3; Hairy Woodpecker, 10; Downy Woodpecker, 6; Blue Jay, 65; Common Crow, 1; Black-capped Chickadee, 137; White-breasted Nuthatch, 24; Brown Creeper, 4; Eastern Bluebird, 1; Golden-crowned Kinglet, 8; Northern Shrike, 2; Starling, 526; House Sparrow, 705; Eastern Meadowlark, 1; Redwinged Blackbird, 1; Brown-headed Cowbird, 1; Evening Grosbeak, 71; Pine Grosbeak, 17; Common Redpoll, 486; Am. Goldfinch, 58; Tree Sparrow, 10; Song Sparrow, 1. Total, 36 species; 2,609 individuals. (Seen in the area during the count period but not during the count itself were: Black Duck, Canvasback, Bald Eagle, Black-backed Three-toed Woodpecker, Myrtle Warbler, Snow Bunting. The Eastern Bluebird has been in the area where counted

since the beginning of December. Three Iceland Gulls were noted for a period of about twenty minutes by a competent observer. They were in company with both Herring Gulls and Great Black-backed Gull).

J. Bayly (compiler), A. Bell, K. Buell, J. Cartwright, I. Clark, M. Edwards, Miss M. Hewitt, D. Hurrie, Mrs. I. Jarvie, M. Jarvie, Miss E. Johnston, Mrs. H. Johnson, W. Lamb, H. Lapp, Miss N. Mansfield, W. Miller, R. Morrow, Mrs. H. Quilliam, G. Stirrett, A. Strong, Miss D. Webb.

Carleton Place, Ont. (A circle $7\frac{1}{2}$ -mile radius centered on bridge over Mississippi River at Carleton Place).—Dec. 28, 1957; 9 a.m. to 3 p.m.; temp. 28° to 35° ; wind E, 12 m.p.h.; ground was bare and frozen in morning, thawed in p.m. 36 observers in 14 parties. Total party hours, 171; total party miles, 294 (37 on foot, 257 by car).

Common Goldeneye, 2; Ruffed Grouse, 18; Ring-necked Pheasant, 1; Rock Dove, 139; Snowy Owl, 1; Pileated Woodpecker, 2; Hairy Woodpecker, 10; Downy Woodpecker, 1; Blue Jay, 62; Common Crow, 3; Black-capped Chickadee, 93; White-breasted Nuthatch, 9; Brown Creeper, 1; Golden-crowned Kinglet, 3; Northern Shrike, 4; Starling, 77; House Sparrow, 210; Evening Grosbeak, 62; Purple Finch, 6; Pine Grosbeak, 28; Common Redpoll, 349; Am. Goldfinch, 51; Tree Sparrow, 4. Total, 23 species; 1,136 individuals.

Rowley Frith, Alan G. Bland, A. E. Bourguignon, C. E. R. Thompson, Cyril Inderwick, F. R. Robertson, E. H. Ritchie, Dr. D. B. O. Saville, Dr. and Mrs. M. V. N. Murthy, John Bird, H. M. Brown, M. D. Spencer, Misses Charlotte E. Dill and Sheila M. Clark, Mr. and Mrs. Tim Burnett, Mr. and Mrs. Robert Lighthart, Mr. and Mrs. G. S. Davies, Miss Dianne Burnett, Susan Hawkins, Jane Oliver-Bellases, Joanne Hall, Mr. and Mrs. G. E. Findlay, Mr. and Mrs. W. F. Findlay, Mr. and Mrs. W. R. Findlay, David G. Findlay, Timothy Findlay, Peter Findlay, Dan. Findlay, Kate Findlay, Jean Findlay, D. H. and D. D. Findlay (compiler).

Collingwood, Ont. (50% shoreline and open water, 25% deciduous woodland, 25% open country, fields).—Dec. 26, 1957; 9 a.m. to 4.30 p.m.; temp. 30° to 35° ; wind W, 10-15 m.p.h. 14 observers in 3 parties. Total party hours 7; total party miles, 109 (4 on foot, 105 by car).

Red-necked Grebe, 1; Horned Grebe, 4; Black Duck, 3; Common Goldeneye, 81; Bufflehead, 6; Oldsquaw, 4; Common Merganser, 18; Ruffed Grouse, 1; Glaucous Gull, 2; Herring Gull, 775+; Ring-billed Gull, 10; Mourning Dove, 1; Snowy Owl, 1; Hairy Woodpecker, 2; Downy Woodpecker, 4; Blue Jay, 4; Black-capped Chickadee, 58; White-breasted Nuthatch, 4; Whistling Swan, 1; Brown Creeper, 1; Golden-crowned Kinglet, 14; Northern Shrike, 1; Starling, 134; House Sparrow, 500+; Cardinal, 2; Common Redpoll, 33; Tree Sparrow, 16; Snow Bunting, 65. Total, 28 species; 1,747 individuals. (Whistling Swan, uncommon winter observation. Seen in the area during Christmas week: Meadow Lark, Bronzed Grackle, Evening Grosbeaks, Pine Grosbeaks.

A. J. Mitchener (compiler), Dr. K. Edwards, L. A. Holbrooke, G. Wamsley, L. and E. Wambold, J. Walker, J. Kirby, A. C. Cuten, A. Elliott, R. Kirby, J. Baird, N. Chessel, I. Hewson.

Guelph, Ont. ($7\frac{1}{2}$ -mile radius centering on St. George's Square in downtown Guelph; includes City of Guelph and 15-mile stretch of Speed River; occurrence of cover types not yet worked out; area not thoroughly covered).—Dec. 29, 1957; 8.20 a.m. to 4.30 p.m.; mostly cloudy with occasional clear intervals late morning and afternoon; temp. 24° to 30° ; wind SW to NW, 15-25 m.p.h.; 9 observers in 3 parties plus 2 observers at 2 feeding stations. Total party hours, 9 (6 on foot, 3 by car); total party miles, 47 (40 on foot, 7 by car).

Ruffed Grouse, 3; Glaucous Gull, 3; Herring Gull, 210; Ring-billed Gull, 18; Hairy Woodpecker, 2; Downy Woodpecker, 3; Common Crow, 1; Black-capped Chickadee, 35; White-breasted Nuthatch, 5; Northern Shrike, 1; Starling, 75; House Sparrow, 68 (55-13); Cardinal, 1; Pine Grosbeak, 4; Am. Goldfinch, 9; Slate-colored Junco, 1; Tree Sparrow, 6. Total, 17 species; 445 individuals. (Seen in area during count period: Great Blue Heron, Mallard, Black Duck, Am. Widgeon, Common Merganser, Sparrow Hawk, Great Horned Owl, Belted Kingfisher, Pileated Woodpecker, Blue Jay, Pine Siskin, White-winged Crossbill).

Mr. and Mrs. Carman Burton, Mr. and Mrs. Ralph Comfort, Alex Cringan, Antoon de Vos, Jacob Kalf, Grant Love, Stuart MacKay, Robert Mason, William Steele.

Hamilton, Ont. ($7\frac{1}{2}$ -mile radius centering on York and Dundurn streets, and including Hamilton, Burlington, Lake Medad, Dundas, Greensville, Ancaster, Mineral Springs, Southcote, Hannon and Stoney Creek).—Dec. 29, 1957; 7 a.m. to 10.30 p.m.; overcast; temp. 26° to 36° ; wind SW, 10-17 m.p.h.; ground bare; Dundas Marsh and Hamilton Harbour open. 67 observers in 29 parties. Total party hours, 196 (187 on foot, 9 by car); total party miles, 388 (240 on foot, 148 by car).

Red-necked Grebe, 1; Horned Grebe, 5; Great Blue Heron, 3; Mallard, 187; Black Duck, 197; Am. Widgeon, 2; Redhead, 3; Canvasback, 12; Greater Scaup, 161; Lesser Scaup, 1; Common Goldeneye, 179; Bufflehead, 21; Oldsquaw, 491; White-winged Scoter, 3; Ruddy Duck, 1; Hooded Merganser, 1; Common Merganser, 2000; Red-breasted Merganser, 74; Red-tailed Hawk, 38; Red-shouldered Hawk, 1; Rough-legged Hawk, 9; Marsh Hawk, 2; Sparrow Hawk, 27; Ruffed Grouse, 9; Ring-necked Pheasant, 54; Gray Partridge, 4; Killdeer, 5; Glaucous Gull, 3; Iceland Gull (Kumlien's), 1; Great Black-backed Gull, 82; Herring Gull, 2,500; Ring-billed Gull, 65; Mourning Dove, 3; Screech Owl, 4; Great Horned Owl, 11; Long-eared Owl, 30; Saw-whet Owl, 1; Belted Kingfisher, 10; Yellow-shafted Flicker, 2; Pileated Woodpecker, 3; Red-headed Woodpecker, 3; Hairy Woodpecker, 80; Downy Woodpecker, 130; Blue Jay, 167; Common Crow, 542; Black-capped Chickadee, 622; White-breasted Nuthatch, 122; Red-breasted Nuthatch, 15; Brown Creeper, 31; Carolina Wren, 1; Am. Robin, 2; Catbird, 1; Golden-crowned Kinglet, 46; Cedar Waxwing, 12; Northern Shrike, 7; Starling, 7500; Myrtle Warbler, 1; House Sparrow, 1550; Common Grackle, 6; Cardinal, 156; Evening Grosbeak, 2; Purple Finch, 34; Pine Grosbeak, 17; Hoary Redpoll, 1; Common Redpoll, 137; Pine Siskin, 130; Am. Goldfinch, 160; Slate-colored Junco, 287; Tree Sparrow, 400; Chipping Sparrow, 1; Field Sparrow, 3; White-throated Sparrow, 1; Swamp Sparrow, 14; Snow Bunting, 3. Total, 75 species; about 18,452 individuals. (Seen in area in count period: Goshawk, Pigeon Hawk, Winter Wren, Mockingbird, Eastern Meadowlark, Red Crossbill, White-winged Crossbill, Rufous-sided Towhee, Oregon Junco).

Stuart Alexander, Mr. and Mrs. Frank Bell, Miss Barbara Blackmore, Mr. and Mrs. R. D. F. Bourne, Miss Stella Brown, James Burns, Donald Campbell, William I. Campbell, Kenneth J. Cox, John Cumming, Robert Curry, Edward Dinniwell, James A. N. Dowall, Vincent Duff, Ian Halladay, Peter Hamel, Fred Helleiner, John Hencher, Robert Henry, George Holland, Mr. and Mrs. William Holley, Roger Jackson, John Kennett, Miss Margaret Lamb, Woodburn Lambe, Mrs. John Lamoureux, Thomson Lawrie, Miss Suzanne Lawrie, Miss A. E. LeWarne, Mr. and Mrs. Robert H. Lloyd, Dr. R. G. C. MacLaren, Harold MacPherson, Mr. and Mrs. George McBride, C. Douglas McCallum, Dr. and Mrs. George O. McMillan, John B. Miles, Dr. and Mrs. John Miller, James Morrow, Mrs. Carl M. Morden, Dugald Moule, John A. Moule, Mr. and Mrs. Albert B. Nind, George W. North (compiler), Mrs. George W. North, John Olmsted, David K. Powell, Robert K. Sargeant, Mr. and Mrs. Frank Schneider, William Shaw, Miss Eunice Smillie, Robert Stamp, Miss Laura Stewart, Danny Strickland, Miss Ann Watson, Miss Jane Watson, Miss Mabel Watson, J. Harvey Williams, Robert Zavitz (Hamilton Nature Club).

Huntsville, Ont. (Dec. 28, 1957, 8 a.m. to 5 p.m.; temp. 28° to 24°; no measurable wind; light snowfall until early afternoon, then clearing; lakes and rivers mostly open, following two weeks of mild weather; 3-4 inches old snow in bush, 2 inches new snow. 31 observers in 12 parties. Total party hours, 30 (20 on foot, 10 by car); total party miles, 126 (24 on foot, 102 by car).

Ruffed Grouse, 4; Herring Gull, 23; Hairy Woodpecker, 32; Downy Woodpecker, 24; Gray Jay, 9; Blue Jay, 22; Common Raven, 12; Blackcapped Chickadee, 153; White-breasted Nuthatch, 36; Red-breasted Nuthatch, 19; Brown Creeper, 2; Golden-crowned Kinglet, 2; Northern Shrike, 1; Starling, 88; House Sparrow, 169; Common Grackle, 1; Cardinal, 2; Evening Grosbeak, 61; Pine Grosbeak, 12; Common Redpoll, 60; White-winged Crossbill, 9; Snow Bunting, 210. Total, 22 species; 951 individuals.

Mrs. Edgar Brook, Mr. and Mrs. A. C. Conway, Paul Conway, Douglas Conway, Beverly Conway, Patricia Conway, Mrs. E. Farnsworth, Dorothy Fletcher, Vernon Graham, Mrs. J. Heron, Mrs. Gordon Hill, Gerry Jenkins, James Kay, Mr. and Mrs. Gerald Keetch, Mrs. Langridge, Aubrey May, Nancy May, Ken Perrin, Mrs. H. L. Reazin, Mr. and Mrs. E. G. R. Rogers, Dr. and Mrs. Ross Rogers, Susan Rogers, Frank Rogers, Russell J. Rutter (compiler), Mr. and Mrs. W. Waters, Mrs. George Wilson (Huntsville Nature Club).

Kingston, Ont. (7½-mile radius centering on Garden Island, including Cataraqui River and Creek, Lake Ontario, St. Lawrence River, Wolfe and adjacent islands).—Dec. 21, 1957; 7 a.m. to 4.30 p.m.; rain in morning; temp. 40° to 45°; wind SW, 15-40 m.p.h.; low areas flooded after heavy rain; all bodies of water open; no snow or cold spells recently. 18 observers in 8 parties. Total party hours, 63 (33 on foot, 30 by car); total party miles, 364 (44 on foot, 320 by car).

Common Loon, 2; Horned Grebe, 26; Mallard, 22; Black Duck, 159; Green-winged Teal, 1; Am. Widgeon, 2; Ring-necked Duck, 1; Canvasback, 283; Greater Scaup, 1862; Common Goldeneye, 863; Bufflehead, 22; Common Merganser, 399; Rough-legged Hawk, 8; Sparrow Hawk, 1; Ruffed Grouse, 6; Gray Partridge, 15;

Glaucous Gull, 21; Iceland Gull, 3; Great Black-backed Gull, 64; Herring Gull, 498; Ring-billed Gull, 148; Bonaparte's Gull, 4; Great Horned Owl, 2; Snowy Owl, 2; Belted Kingfisher, 1; Hairy Woodpecker, 8; Downy Woodpecker, 10; Blue Jay, 61; Common Crow, 104; Black-capped Chickadee, 171; White-breasted Nuthatch, 28; Brown Creeper, 3; Winter Wren, 1; Carolina Wren, 1; Am. Robin, 2; Golden-crowned Kinglet, 1; Northern Shrike, 5; Starling, 1493; House Sparrow, 356; Eastern Meadowlark, 1; Evening Grosbeak, 14; Common Redpoll, 56; Am. Goldfinch, 2; Slate-colored Junco, 2; Tree Sparrow, 77; Field Sparrow, 3; Song Sparrow, 5; Lapland Longspur, 100. Total, 48 species; about 6,920 individuals.

Jim Bayly, Art Bell, John Cartwright (compiler), Dr. Ken Edwards, Mary Edwards, Dr. Martin Edwards, Art Hyde, Walter Lamb, Lou Lowther, Mary L'Estrange, Mrs. Shirley Peruniak, Mrs. Helen Quilliam, Dr. and Mrs. George M. Stirrett, Alden Strong, Al Warren, Deirdre Webb, Nora Mansfield.

Kirkland, Lake, Ont. (7½-mile radius centering on a point on No. 112 highway one mile north of Dane; forested 65%; fields 20%; town 5%; slimes 5%; marsh 5%).—Dec. 22, 1957; 5.30 a.m. to 6 p.m.; overcast; temp. 24° to 32°, wind SW, 15 m.p.h.; 4 in. snow in open, 6 in. in bush; lakes frozen, streams mostly open. 16 observers in 8 parties. Total party hours, 25 (18½ on foot, 6½ by car); total party miles, 138 (27 on foot, 111 by car).

Ruffed Grouse, 5; Great Horned Owl, 3; Hairy Woodpecker, 11; Gray Jay, 17; Blue Jay, 10; Common Raven, 7; Black-capped Chickadee, 98; Boreal Chickadee, 11; Red-breasted Nuthatch, 4; Northern Shrike, 1; Starling, 8; Evening Grosbeak, 2; Pine Grosbeak, 15; Common Redpoll, 4; White-throated Sparrow, 1; Snow Bunting, 12. Total, 16 species; 209 individuals.

Mrs. K. Bennett, F. M. Helleiner, J. H. Hodgins, M. Johnson, Ralph Karlson, Ruth Karlson, R. J. McClanaghan (compiler), P. W. Richter, I. Robertson, Mrs. W. S. Savage, Mr. and Mrs. J. G. Stephenson, Miss A. L. Stewart, Mrs. George Timmins, George Timmins Jr., Mrs. R. Walker, F. Washington (Kirkland Lake Nature Club).

Kitchener, Ont. (7½-mile radius centering on extreme SW boundary of Kitchener; cattail marsh 2%; open land 23%; deciduous woods 25%; suburbs 2%; open water 2%; coniferous woods 25%; swamp 21%).—Dec. 22, 1957; 8 a.m. to 4.30 p.m.; overcast to sunny; temp. 31° to 45°; wind SW to WNW, 15 to 10 m.p.h.; no snowfall; ground bare, all water open. 29 observers in 6 parties. Total party hours, 42½ (38 on foot, 4½ by car); total party miles, 163 (39 on foot, 124 by car).

Great Blue Heron, 1; Black Duck, 12; Common Goldeneye, 32; Common Merganser, 9; Goshawk, 1; Red-tailed Hawk, 11; Sparrow Hawk, 1; Ruffed Grouse, 7; Ring-necked Pheasant, 7; Herring Gull, 95; Ring-billed Gull, 3; Rock Dove, 58; Screech Owl, 1; Great Horned Owl, 2; Long-eared Owl, 8; Belted Kingfisher, 4; Pileated Woodpecker, 2; Hairy Woodpecker, 9; Downy Woodpecker, 40; Blue Jay, 15; Common Crow, 3; Black-capped Chickadee, 192; White-breasted Nuthatch, 31; Red-breasted Nuthatch, 2; Brown Creeper, 15; Winter Wren, 1; Am. Robin, 1; Golden-crowned Kinglet, 62; Northern Shrike, 7; Starling, 81; House Sparrow, 294; Cardinal, 35; Evening Grosbeak, 32; Pine Grosbeak, 6; Common Redpoll, 75; Pine Siskin, 2; Am. Goldfinch, 136; Slate-colored Junco, 49; Tree Sparrow, 36; Song Sparrow, 2. Total, 40 species; 1,380 individuals.

Willard H. Schaefer, F. W. R. Dickson, Eric M. Carter, Morley Preston, Robert Pickering, R. C. Hilborn (leaders); Ross Campbell, Dorothy Campbell, Craig Campbell (compiler), Margaret Lemon, Norman Shantz, Horace Dahmer, Earlmont Poth, R. E. Scheffel, James Carter, John Bindernagel, Stephen Underhill, Joyce Preston, James Detweiler, Robert Wilkins, Allan Heslop, Douglas Ainsworth, Dr. J. B. Sanders, Elizabeth Hagey, Harold Ellenton, Linda Preston, Arno Schatt, Ralph Hendry, Mrs. Ralph Hendry.

London, Ont. (London to Delaware, Fanshaw Lake, Byron bog, Trott's swamp, all around University and north of London. River and gullies 50%; farmland 20%; roadsides 15%; mixed woodlots 5%; swamp 10%).—Dec. 28, 1957; 8 a.m. to 4.30 p.m.; river and ponds open; temp. 33° to 37°; wind S by SW, 12-14 m.p.h.; wet snow at 7.30 turning to rain, ending by 8 o'clock, remainder of day overcast; ground bare. 34 observers in 14 parties. Total party hours, 120 (113 on foot, 17 by car); total party miles, 190 (79 on foot, 111 by car).

Pied-billed Grebe, 1; Great Blue Heron, 2; Mallard, 51; Black Duck, 534; Lesser Scaup, 1; Common Goldeneye, 65; Common Merganser, 85; Sharp-shinned Hawk, 1; Cooper's Hawk, 1; Red-tailed Hawk, 41; Rough-legged Hawk, 1; Bald Eagle, 1; Marsh Hawk, 1; Sparrow Hawk, 2; Ruffed Grouse, 1; Bobwhite, 20; Ring-necked Pheasant, 11; Herring Gull, 287; Ring-billed Gull, 2; Mourning Dove, 6; Screech Owl, 1; Great Horned Owl, 3; Long-eared Owl, 2; Short-eared Owl, 12; Belted Kingfisher,

8; Red-bellied Woodpecker, 2; Hairy Woodpecker, 47; Downy Woodpecker, 90; Blue Jay, 81; Common Crow, 11; Black-capped Chickadee, 244; White-breasted Nuthatch, 51; Red-breasted Nuthatch, 25; Brown Creeper, 14; Winter Wren, 9; Carolina Wren, 1; Am. Robin, 1; Golden-crowned Kinglet, 48; Ruby-crowned Kinglet, 1; Northern Shrike, 4; Starling, 357; House Sparrow, 1773; Eastern Meadowlark, 1; Cardinal, 201; Evening Grosbeak, 10; Purple Finch, 16; Common Redpoll, 36; Pine Siskin, 1; Am. Goldfinch, 139; Slate-colored Junco, 108; Tree Sparrow, 129; Field Sparrow, 3; Swamp Sparrow, 1; Song Sparrow, 7; Snow Bunting, 1. Total, 55 species; 4,552 individuals.

James Leach (compiler), J. C. Laughton, D. W. Sutton, Mr. and Mrs. Wm. Gisling, Lynn Ball, Alan Westbrook, Peter Middleton, Glenn Pincombe, Eli Davis, Mr. and Mrs. Harold Leach, Mrs. Spruce, Mrs. G. Cummings, Mr. and Mrs. W. Day, Dr. and Mrs. C. Cline, Walter Parsons, Paul Mackenzie, Charles, Ted and Wm. Maddeford, D. Carr, Dr. Hobbs, Brandon Hobbs, Carolyn Hobbs, Dr. G. Aitken, H. Nugent, H. Keast, V. Franks, G. Muller, Laura Sweeten, Mr. and Mrs. J. C. Higgins.

Melbourne, Ont. (A fifteen-mile circle centered one mile north of West Lorne. Parts of the Townships of Aldborough, Dunwich, Ekfrid and Mosa are included).—Dec. 26, 1957; 6.30 a.m. to 5.30 p.m.; temp. 34° to 28°; wind SW, 10 to 25 m.p.h.; no snow on ground; all water open; complete overcast in morning, broken overcast in afternoon. 11 observers in 3 parties. Total party hours, 28 (14 on foot, 14 by car); total party miles, 166 (20 on foot, 146 by car).

Common Goldeneye, 333; Red-breasted Merganser, 2; Cooper's Hawk, 1; Red-tailed Hawk, 26; Red-shouldered Hawk, 1; Rough-legged Hawk, 18; Marsh Hawk, 32; Sparrow Hawk, 5; Ruffed Grouse, 4; Bobwhite, 32; Ring-necked Pheasant, 6; Herring Gull, 143; Ring-billed Gull, 36; Bonaparte's Gull, 1; Rock Dove, 39; Mourning Dove, 55; Screech Owl, 2; Great Horned Owl, 2; Short-eared Owl, 21; Belted Kingfisher, 2; Pileated Woodpecker, 2; Red-bellied Woodpecker, 2; Hairy Woodpecker, 13; Downy Woodpecker, 33; Horned Lark, 33; Blue Jay, 7; Common Crow, 2; Black-capped Chickadee, 108; White-breasted Nuthatch, 12; Red-breasted Nuthatch, 7; Brown Creeper, 14; Am. Robin, 1; Golden-crowned Kinglet, 9; Northern Shrike, 2; Starling, 174; House Sparrow, 376; Eastern Meadowlark, 12; Redwinged Blackbird, 1; Brown-headed Cowbird, 3; Cardinal, 105; Am. Goldfinch, 3; Slate-colored Junco, 56; Tree Sparrow, 168; Song Sparrow, 6. Total, 44 species; 1,910 individuals. (Seen during count period: Yellow-shafted Flicker, Mockingbird, Evening Grosbeak).

Edwin Graff, Florence Graff, Robert Hopper, Donald Johnson, James Lemon, Tom Lemon, V. E. Lemon, Dougald Murray (compiler), David Robinson, James Shostock, Robert Shostock.

North Bay, Ont. (Township of West Ferris, North Himsforth to Wasi Falls, North Bay and Widdifield Twp. Mixed second-growth bushland 45%; mainly jackpine 30%; burnt-over bush 10%; settlements 10%; rivers, marshes 5%).—Dec. 28, 1957; 7.30 a.m. to 5 p.m.; mainly clear, sunny; temp. 20° to 19°; wind NW, N, SW, E, 14-9 m.p.h.; ground covered with about one inch of fresh snow; lakes frozen but rivers and creeks mainly open. 5 observers in 1 party. Total party hours, 88½ (6 hr.40m. on foot, 1hr.50m. by car); total party miles, 68 (9 on foot, 59 by car).

Hairy Woodpecker, 2; Downy Woodpecker, 1; Blue Jay, 3; Black-capped Chickadee, 19. Total, 4 species; 25 individuals. All birds, with the exception of 11 Chickadees, were seen at compiler's feeding station. (Other species seen between Dec. 21 and Jan. 1: Ruffed Grouse, Herring Gull, Pileated Woodpecker, Gray Jay, Evening Grosbeak, Pine Grosbeak, Starling, White-breasted Nuthatch).

T. C. Cusson, Lucille Cusson, Helen Willoughby, Edith Munns, Hazel Petty (compiler) (Nipissing Field Naturalists).

Ottawa, Ont. (7½-mile radius from Parliament Hill; town and suburb, fields, deciduous woods, coniferous scrub, river banks).—Dec. 22, 1957; 7.30 a.m. to 4.30 p.m.; temp. 33° to 41°; wind W to SE, 4 to 12 m.p.h.; partly cloudy in a.m., clear in p.m.; no snow; lakes and ponds frozen, but rivers mainly open. 37 observers in 13 parties. Total party hours, 86; total party miles 413 (79 on foot, 334 by car).

Canada Goose, 4; Black Duck, 40; Common Goldeneye, 71; Hooded Merganser, 1; Common Merganser, 50; Sparrow Hawk, 3; Ruffed Grouse, 7; Ring-necked Pheasant, 11; Gray Partridge, 36; Iceland Gull, 1; Great Black-backed Gull, 1; Herring Gull, 185; Ring-billed Gull, 1; Rock Dove, 482; Mourning Dove, 3; Great Horned Owl, 2; Short-eared Owl, 1; Pileated Woodpecker, 1; Hairy Woodpecker, 8; Downy

Woodpecker, 18; Gray Jay, 1; Blue Jay, 50; Common Crow, 32; Black-capped Chickadee, 215; White-breasted Nuthatch, 42; Brown Creeper, 7; Am. Robin, 1; Golden-crowned Kinglet, 5; Northern Shrike, 8; Starling, 997; House Sparrow, 1095; Evening Grosbeak, 64; Pine Grosbeak, 49; Hoary Redpoll, 6; Common Redpoll, 948; Am. Goldfinch, 22; White-winged Crossbill, 1; Tree Sparrow, 4; White-throated Sparrow, 1; Snow Bunting, 137. Total, 40 species; 4,611 individuals.

A. W. F. Banfield, Miss A. Banning, Mr. and Mrs. D. R. Beckett, Mr. and Mrs. J. Bird, A. E. Bourguignon, K. W. Bowles, H. M. Brown, Miss S. M. Clark, D. D. Findlay, Mr. and Mrs. D. K. Findlay, Dr. and Mrs. C. Frankton, Mr. and Mrs. R. E. Frith, H. C. Gibbs, W. E. Godfrey, Miss V. Humphreys, H. Lloyd, Mr. and Mrs. H. Marshall, E. H. McEwen, E. Mills, F. Munro, E. H. Ritchie, Dr. (compiler) and Mrs. D. B. O. Savile, Mr. and Mrs. P. Scott, Dr. and Mrs. D. A. Smith, P. Smith, W. J. Smith, M. D. Spencer, L. Stevenson.

Peterborough, Ont. (Approx. 18-mile radius of Peterborough; open farmland 45%, marsh 15%; Water 5%; coniferous woods 5%; deciduous woods 5% mixed woods 25%).—Dec. 28, 1957; 8.15 a.m. to 5 p.m.; temp. 36° to 39°; wind SW, 5-10 m.p.h.; visibility good to fair; ground frozen; no snow; river open. 23 observers in 7 parties. Total party hours, 56; total party miles, 356 (22 on foot, 334 by car).

Pied-billed Grebe, 1; Great Blue Heron, 1; Mallard, 2; Common Goldeneye, 1; Common Merganser, 6; Goshawk, 1; Sparrow Hawk, 2; Ruffed Grouse, 8; Ring-necked Pheasant, 3; Herring Gull, 15; Rock Dove, 176; Belted Kingfisher, 1; Pileated Woodpecker, 2; Hairy Woodpecker, 8; Downy Woodpecker, 16; Blue Jay, 38; Common Crow, 1; Black-capped Chickadee, 285; White-breasted Nuthatch, 28; Brown Creeper, 1; Golden-crowned Kinglet, 14; Northern Shrike, 4; Starling, 457; House Sparrow, 462; Cardinal, 1; Evening Grosbeak, 140; Purple Finch, 1; Pine Grosbeak, 24; Common Redpoll, 920; Pine Siskin, 6; Am. Goldfinch, 96; Tree Sparrow, 61; Snow Bunting, 1. Total, 33 species; 2,783 individuals.

D. Sadler, S. Bond, K. W. Strasser, T. Smith, P. McGillen, Mr. and Mrs. G. Green, M. V. Powell, J. H. Johnson, W. J. Smith, R. Chandler, Mr. and Mrs. V. Chandler, K. Baker, P. Bristow, Audrey Wilson, E. McDonald, Lola Leach, A. Bunker, Miss Bunker, M. Pomeroy, F. R. Pammett and J. L. McKeever (compilers).

Pickering, Ont. (From West City limits of Oshawa to Newcastle on Lake Ontario forming a radius of 20 miles from the center of Oshawa to Lake Skugog, east to Pontypool).—Dec. 22, 1957; 8 a.m. to 4 p.m.; temp 32° to 40°; wind S, 5 m.p.h. 16 observers in 5 parties. Total party hours, 92; total party miles, 174 (47 on foot, 127 by car).

Great Blue Heron, 2; Am. Bittern, 1; Black Duck, 90; Common Goldeneye, 58; Oldsquaw, 308; Common Merganser, 13; Red-breasted Merganser, 2; Marsh Hawk, 1; Peregrine Falcon, 1; Pigeon Hawk, 1; Sparrow Hawk, 6; Ruffed Grouse, 13; Ring-necked Pheasant, 13; Great Black-backed Gull, 16; Herring Gull, 394; Ring-billed Gull, 30; Rock Dove, 218; Mourning Dove, 24; Long-eared Owl, 1; Short-eared Owl, 1; Saw-whet Owl, 1; Belted Kingfisher, 1; Hairy Woodpecker, 17; Downy Woodpecker, 12; Black-backed Three-toed Woodpecker, 4; Horned Lark, 1; Blue Jay, 25; Common Crow, 40; Black-capped Chickadee, 490; White-breasted Nuthatch, 15; Red-breasted Nuthatch, 1; Brown Creeper, 1; Winter Wren, 1; Carolina Wren, 1; Golden-crowned Kinglet, 41; Northern Shrike, 4; Starling, 165; House Sparrow, 352; Cardinal, 15; Evening Grosbeak, 24; Purple Finch, 13; Pine Grosbeak, 12; Common Redpoll, 42; Pine Siskin, 2; Am. Goldfinch, 150; Slate-colored Junco, 20; Tree Sparrow, 87; Swamp Sparrow, 2; Song Sparrow, 10; Snow Bunting, 2. Total, 50 species; 2,731 individuals.

Alf. Bunker (compiler), Charles Christy, Forrest Dilling, Roy Flemming, W. Fisher, Jake Laird, Brian Nauss, Bill Neal, Glen Owen, Jim Richards, Mrs. Ara Sands, George Scott, Brian Seton, John Theberge, Ted and Ron Tozer.

Pickering Township, Ont. (15 acres of mixed woodland; white cedar 20%; hemlock 20%; poplar, birch, ironwood, maple 45%; uncultivated fields 15%; three miles of country roads, fields 50%; mixed woodland 50%; including 3 feeding stations).—Dec. 28, 1957; 7.30 a.m. to 5.05 p.m.; overcast (briefly partly cloudy); temp. 32° to 35°; wind, variable becoming W, 15 m.p.h.; ground clear, creek running almost full, ponds with some "window-pane" ice; ground frozen at dawn becoming muddy. 2 observers in 1 party. Total party hours, 9½ (4½ on foot, 1 by car); total party miles, 7 (4 on foot, 3 by car).

Herring Gull, 1; Hairy Woodpecker, 1; Downy Woodpecker, 6; Blue Jay, 3; Black-capped Chickadee, 26; White-breasted Nuthatch, 5; Brown Creeper, 2; Am.

Robin, 1; Golden-crowned Kinglet, 3; House Sparrow, 37; Am. Goldfinch, 100; Slate-colored Junco, 8; Oregon Junco, 1; Tree Sparrow, 12. Total, 14 species; 213 individuals.

Doris Huestis Speirs (compiler), John Murray Speirs.

Port Arthur and Fort William, Ont. (Silver Harbour south along Highway 17 to Fort William, and to Chippewa Park, west to Murillo, north to Kivikoski, south to Port Arthur. Mixed woodlands and settled areas).—Dec. 28, 1957; 8 a.m. to 5 p.m.; cloudy dull; temp. 16° to -5°; wind NW, 10 to 24 m.p.h.; 6 inches snow; a few open areas near shore in Lake Superior, all other waters frozen. 19 observers in 12 parties; Total party hours, 38 (13 on foot, 25 by car); total party miles, 314 (15 on foot, 299 by car).

Common Goldeneye, 170; Gray Partridge, 3; Herring Gull, 140; Rock Dove, 487; Snowy Owl, 2; Hairy Woodpecker, 7; Downy Woodpecker, 9; Gray Jay, 8; Blue Jay, 24; Common Raven, 137; Common Crow, 2; Black-capped Chickadee, 59; Boreal Chickadee, 3; Northern Shrike, 1; Starling, 298; House Sparrow, 2168; Evening Grosbeak, 21; Pine Grosbeak, 48; Common Redpoll, 248. Total, 19 species; 3,835 individuals. (Goshawk, Rough-legged Hawk, Sharp-tailed Grouse, Pine Siskin, seen during count period).

Dr. and Mrs. A. E. Allin, R. D. Brougham, Rev. W. Cook, Keith Denis (compiler), R. Denis, C. E. Garton, Mrs. A. F. Hanton, Mrs. W. P. Hogarth, D. Hurd, Mrs. M. Knowles, I. Robb, R. Robb, S. Robb, W. Robinson, C. Rydholm, Mrs. C. Saucier, Miss M. Smith, J. Thompson.

Richmond Hill, Ont. (Woods, fields, some marsh. Limit of 15 miles in any direction from Richmond Hill. Woods, riverbeds, small lake areas, fields and roadsides).—Dec. 26, 1957; 8.30 a.m. to 4 p.m.; temp. 35° to 40°; wind, very little. 14 observers in 4 parties. Total party hours, 98; total party miles, 154 (23 on foot, 131 by car).

Rough-legged Hawk, 1; Sparrow Hawk, 1; Ring-necked Pheasant, 4; Herring Gull, 8; Pileated Woodpecker, 1; Hairy Woodpecker, 15; Downy Woodpecker, 15; Blue Jay, 31; Common Crow, 2; Black-capped Chickadee, 169; White-breasted Nuthatch, 26; Brown Creeper, 5; Golden-crowned Kinglet, 33; Northern Shrike, 2; Starling, 25; Myrtle Warbler, 1; Cardinal, 20; Evening Grosbeak, 9; Pine Grosbeak, 15; Am. Goldfinch, 202; Slate-colored Junco, 12; Tree Sparrow, 18; Song Sparrow, 1. Total, 23 species; 676 individuals.

Mr. and Mrs. T. Boardman, Mr. and Mrs. P. Addison, Mr. R. Stanfield, Mr. J. W. Large, Mr. O. Devitt, Dr. and Mrs. E. Meade, William Addison, P. Addison, Lyn Jackman, David Gibson, David Tinker, Dr. Lillian C. Langstaff (compiler) (Richmond Hill Naturalists).

Rutherglen, Ont. (From township of Bonfield, villages of Bonfield, Rutherglen, areas around rivers Mattawa, Amable du Fond, Ottawa to town of Mattawa; open farmland 10%; mixed second growth forest 50%; bogs 5%; lakes, rivers 20%; settlements 15%).—Dec. 31, 1957; 7.30 a.m. to 3.30 p.m.; blue sky to snowing; temp. 19° to 24°; wind W veering E to S, 2 to 10 m.p.h.; ground covered by 1 inch of snow; ice on the lakes not carrying, all water with a current open. 1 observer. Total party hours, 8 (6 on foot, 2 by car); total party miles, 43 (4 on foot, 39 by car).

Common Goldeneye, 3; Ruffed Grouse, 1; Hairy Woodpecker, 17; Downy Woodpecker, 6; Gray Jay, 8; Blue Jay, 6; Common Raven, 1; Black-capped Chickadee, 40; White-breasted Nuthatch, 2; Red-breasted Nuthatch, 3; Brown Creeper, 2; Starling, 3; Pine Grosbeak, 7; Snow Bunting, 28. Total, 14 species; approximately 132 individuals.

Louise de Kiriline Lawrence.

Toronto, Ont. (Many established routes, north to Pottageville, west to Clarkson and east to Whitby).—Dec. 22, 1957; 7.45 a.m. to 5 p.m.; temp. mean 39°; sunny, ground all bare, creeks open, no sign of ice or snow anywhere. 114 observers in 28 parties. Total party hours, 177 hr. 40 min.; (average per party, 6 hr., 32 min.).

Red-necked Grebe, 1; Great Blue Heron, 2; Mallard, 815; Black Duck, 855; Pintail, 1; Green-winged Teal, 2; Blue-winged Teal, 1; Am. Widgeon, 2; Redhead, 1; Canvasback, 2; Greater Scaup, 1335; Lesser Scaup, 3; Common Goldeneye, 443; Bufflehead, 142; Oldsquaw, 3670; White-winged Scoter, 9; Hooded Merganser, 1; Common Merganser, 57; Red-breasted Merganser, 3; Goshawk, 1; Sharp-shinned Hawk, 1; Cooper's Hawk, 4; Red-tailed Hawk, 29; Rough-legged Hawk, 7; Marsh Hawk, 2; Sparrow Hawk, 47; Ruffed Grouse, 4; Ring-necked Pheasant, 192; Am. Coot, 1; Glaucous Gull, 4; Great Black-backed Gull, 36; Herring Gull, 2,676; Ring-

billed Gull, 625; Mourning Dove, 12; Great Horned Owl, 8; Snowy Owl, 4; Hawk Owl, 1; Long-eared Owl, 8; Saw-whet Owl, 2; Belted Kingfisher, 2; Yellow-shafted Flicker, 2; Pileated Woodpecker, 6; Hairy Woodpecker, 99; Downy Woodpecker, 179; Horned Lark, 1; Blue Jay, 177; Common Crow, 22; Black-capped Chickadee, 838; White-breasted Nuthatch, 168; Red-breasted Nuthatch, 17; Brown Creeper, 38; Winter Wren, 1; Carolina Wren, 4; Am. Robin, 3; Golden-crowned Kinglet, 79; Cedar Waxwing, 6; Northern Shrike, 17; Starling, 1736; House Sparrow, 1872; Eastern Meadowlark, 4; Redwinged Blackbird, 5; Rusty Blackbird, 1; Common Grackle, 1; Cardinal, 103; Evening Grosbeak, 14; Purple Finch, 8; Pine Grosbeak, 57; Common Redpoll, 102; Pine Siskin, 2; Am. Goldfinch, 403; Red Crossbill, 1; White-winged Crossbill, 3; Rufous-sided Towhee, 2; Slate-colored Junco, 307; Oregon Junco, 1; Tree Sparrow, 404; White-throated Sparrow, 5; Song Sparrow, 48. Total, 78 species; 17,747 individuals.

W. Addison, J. Baillie (compiler), H. Barnett, G. M. Bartmen, G. Bennett, O. Bennett, F. Bodsworth, M. Boggs, O. D. Boggs, O. D. Boggs, Jr., Ralph Brown, Robert Brown, Ruth Brown, A. Bunker, D. Burton, L. Butcher, V. Carter, C. H. D. Clarke, D. Clarke, L. Clarke, S. Clarke, F. Crawford, J. Dales, C. Davies, I. Davies, A. Dawe, O. E. Devitt, F. H. Emery, G. Fairfield, J. Fairfield, J. B. Falls, T. Farley, L. Farr, W. Farr, L. Galbraith, B. Geale, D. Geale, J. Geale, C. Goodwin, D. Gunn, J. Gunn, W. W. H. Gunn, H. Halliday, M. Halliday, R. Hansell, P. Harrington, P. Higgins, W. Higgins, J. Hogg, D. Hughes, J. Humphreys, C. Ireson, L. Jackman, R. James, R. Knights, G. Lambert, H. Lawrence, B. LeVay, F. LeVay, J. LeVay, N. LeVay, H. Lumsden, J. Lunn, J. Mackintosh, R. Maclelland, William Martin, A. Mason, J. Mayall, K. Mayall, I. Metcalfe, G. Myland, D. O'Brien, G. Page, R. Pannell, J. Parker, D. Perks, J. Purkis, A. Reid, H. Richards, D. Ripley, M. Ripley, R. Ritchie, J. Satterly, R. M. Saunders, D. Scovell, J. Sherrin, T. M. Shortt, L. Simmons, S. Skolnick, F. Smith, J. Smith, W. W. Smith, H. Southam, D. H. Speirs, E. Stark, N. Stewart, D. Sumner, L. Szijj, E. H. Taylor, R. Taylor, R. Trowern, N. Verbeek, E. Waltho, H. Warwick, E. Wasserfall, W. Wasserfall, E. Welch, E. West, J. D. West, M. West, B. Westcott, W. Williams, Roy Wilson, J. Woods (members and friends of the Brodie Club).

Westport, Ont. ($7\frac{1}{2}$ -mile radius centering on village municipal office; farmland 15%, lakes 20%; marshes 5%; deciduous woodland 40%; red cedar groves 2%; mixed woodland 18%).—Dec. 28, 1957; 8 a.m. to 4 p.m.; cloudy, clear 10 a.m.; temp. 30° to 35°; wind E, 10 to 15 m.p.h.; ground bare, first freeze-up Nov. 26, all lakes again open Dec. 25. 12 observers in 5 parties. Total party hours, 38 ($17\frac{1}{2}$ on foot, $20\frac{1}{2}$ by car); total party miles, 257 (29 on foot, 228 by car).

Common Loon, 2; Black Duck, 6; Common Goldeneye, 76; Common Merganser, 438; Cooper's Hawk, 1; Rough-legged Hawk, 1; Bald Eagle, 3; Peregrine Falcon, 1; Ruffed Grouse, 13; Herring Gull, 61; Ring-billed Gull, 81; Pileated Woodpecker, 2; Hairy Woodpecker, 10; Downy Woodpecker, 4; Blue Jay, 41; Black-capped Chickadee, 193; White-breasted Nuthatch, 14; Brown Creeper, 1; Golden-crowned Kinglet, 1; Northern Shrike, 5; Starling, 20; House Sparrow, 123; Pine Grosbeak, 9; Common Redpoll, 423; Pine Siskin, 11; Am. Goldfinch, 4; Tree Sparrow, 3. Total, 27 species; 1,547 individuals.

J. C. Bayly, A. Bell, D. Crawford, R. Dudley, I. Jarvie, M. Jarvie, J. MacIntyre, N. Mansfield, W. Miller, G. M. Stirtett, A. M. Strong (compiler), D. Webb.

Carlton, Sask. ($7\frac{1}{2}$ -mile radius centering $2\frac{1}{2}$ miles west and $2\frac{1}{2}$ miles south of Carlton; deciduous woods 20%; open farmland 80%).—Dec. 29, 1957; 7.30 a.m. to 5 p.m.; mostly overcast; temp. -34° to -25°; wind E and NE, 15 m.p.h.; 6 inches snow on ground. 6 observers in 2 parties. Total party hours, $14\frac{1}{2}$ ($1\frac{1}{2}$ on foot, 13 by car); total party miles, 69 (2 on foot, 67 by car).

Pigeon Hawk, 1; Ruffed Grouse, 5; Sharp-tailed Grouse, 18; Gray Partridge, 16; Snowy Owl, 1; Hairy Woodpecker, 1; Gray Jay, 1; Black-billed Magpie, 19; Black-capped Chickadee, 10; Starling, 5; House Sparrow, 168; Evening Grosbeak, 22; Pine Grosbeak, 19; Common Redpoll, 151; Snow Bunting, 251. Total, 15 species; 688 individuals.

Margaret Belcher (Regina Natural History Society), Dr. R. M. Bremner, Jonathan Gerrard, J. Frank Roy (Saskatoon Natural History Society), Dr. and Mrs. Stuart Houston (compilers) (Yorkton Natural History Society).

Saskatoon, Sask. (A circle 15 miles in diameter, centered 2 miles south of Saskatoon, including the city, the wooded banks of the Saskatchewan River, 3 golf courses, the Forestry farm and surrounding fields and pastures).—Dec. 26, 1957; 8 a.m. to 4 p.m.; temp. 16° to 34°; wind NE, 20 to 35 m.p.h.; partially cloudy; light snow cover averaging 2 inches deep. 22 observers in 5 parties. Total party hours, $28\frac{1}{2}$ (12 on foot, $16\frac{1}{2}$ by car); total party miles, 155 (22 on foot, 133 by car).

Mallard, 10; Sharp-tailed Grouse, 35; Ring-necked Pheasant, 4; Gray Partridge, 23; Great Horned Owl, 2; Hairy Woodpecker, 5; Downy Woodpecker, 1; Black-billed Magpie, 107; Black-capped Chickadee, 29; Bohemian Waxwing, 1550; House Sparrow, 1206; Evening Grosbeak, 24; Pine Grosbeak, 58; Common Redpoll, 1260; Snow Bunting, 348. Total, 15 species; 4,662 individuals.

J. S. MacLennan, Ted Wedge, T. Wedge, W. Wedge, Lindylou Wedge, R. Pravda, A. Grady, R. Gerrity, G. Gerrity, D. Morris, B. Mills, J. F. Roy (compiler), Dr. R. M. Bremner, Muriel Bremner, M. Bremner, R. Folker, B. Gollop, J. Shadick, J. Hogg, Grace Hogg, J. Mackenzie, P. Cordrey (members of Saskatoon Nat. Hist. Society).

Yorkton, Sask. (7½-mile radius centering on Yorkton; farmland, 20% wooded). Dec. 26, 1957; 8 a.m. to 5.30 p.m.; overcast; temp. 19° to 23°; wind SE, 30 m.p.h.; 6 inches snow on ground. 17 observers in 6 parties. Total party hours, 28 (8½ on foot, 19½ by car); total party miles, 122½ (12½ on foot, 110 by car).

Ruffed Grouse, 1; Sharp-tailed Grouse, 18; Gray Partridge, 36; Great Horned Owl, 2; Downy Woodpecker, 2; Blue Jay, 2; Black-billed Magpie, 28; Black-capped Chickadee, 9; Bohemian Waxwing, 41; Starling, 4; House Sparrow, 219; Pine Grosbeak, 25; Hoary Redpoll, 2; Common Redpoll, 231; Snow Bunting, 274. Total, 15 species; 894 individuals. Snowy Owl, Dec. 29; Hairy Woodpecker, Dec. 24.

Brother Eugene, Brother Joseph, Henry Chilman, Jr., Tom Cursons, Archie Fraser, Art Gellert, Billy Horseman, Dr. and Mrs. Stuart Houston (compilers), Ronald McDonald, Preston McDonald, Bob Pearce, Wayne Pearce, Elwood Sharpe, Cliff Shaw, Jeff Smith, Donald Swaby (Yorkton Natural History Society).

Calgary, Alta. (7½-mile radius centering on Centre Street Bridge and Bow River, including Inglewood Sanctuary, Bowness Park, Glenmore Reservoir, sections banks Bow and Elbow River, Roxborough and Rideau city parks).—Dec. 22, 1957; 8 a.m. to 5 p.m.; mostly sunny; temp. 1° to 38°; wind SSW, 18 m.p.h.; ground bare and frozen; prairie sloughs, Glenmore Reservoir frozen; ponds in Inglewood ice free; Bow and Elbow Rivers open. 8 observers in 4 parties. Total party hours, 24 (12 on foot, 12 by car); total party miles, 188 (11 on foot, 177 by car).

Mallard, 2,203; Green-winged Teal, 1; Redhead, 1; Canvasback, 1; Common Goldeneye, 128; Barrow's Goldeneye, 1; Common Merganser, 8; Goshawk, 1; Prairie Falcon, 2; Ruffed Grouse, 2; Ring-necked Pheasant, 11; Gray Partridge, 20; Killdeer, 1; Snowy Owl, 9; Belted Kingfisher, 1; Black-billed Magpie, 92; Black-capped Chickadee, 21; Brown Creeper, 1; Bohemian Waxwing, 13; Starling, 1; House Sparrow, 274; Pine Grosbeak, 6; Common Redpoll, 37. Total, 23 species; 2,835 individuals. (Seen in count period: Mountain Chickadee, Boreal Chickadee, Red-breasted Nuthatch, Golden-crowned Kinglet, Northern Shrike).

C. J. Barnhardt, E. D. Beacham (compiler), J. Beacham, E. Cheney, J. Clarke, M. J. Cope, W. E. MacKay, N. Winnick (Calgary Bird Club).

Edmonton, Alta. (7½-mile radius from airport; town and suburbs, farmland, mixed woods, river banks).—Dec. 29, 1957; 8 a.m. to 5 p.m.; clear; temp. -2° to -4°; wind SSE, 5 m.p.h.; one-half inch fresh snow. 26 observers in 10 parties. Total party hours, 34½ (26½ on foot, 8 by car); total party miles, 120 (20 on foot, 100 by car).

Mallard, 63; Pintail, 2; Common Goldeneye, 9; Common Merganser, 1; Rough-legged Hawk, 1; Pigeon Hawk, 1; Ruffed Grouse, 3; Sharp-tailed Grouse, 2; Ring-necked Pheasant, 42; Gray Partridge, 26; Rock Dove, 48; Snowy Owl, 1; Boreal Owl, 1; Hairy Woodpecker, 6; Downy Woodpecker, 6; Blue Jay, 16; Black-billed Magpie, 148; Black-capped Chickadee, 129; Boreal Chickadee, 4; Brown Creeper, 1; Bohemian Waxwing, 628; Starling, 6; House Sparrow, 332; Pine Grosbeak, 56; Common Redpoll, 60. Total, 25 species; 1,592 individuals.

A. Allan, K. Ball (compiler), A. Blades, E. Blades, H. Campbell, S. Campbell, M. Forge, C. Hampson, M. Hampson, H. Habgood, J. Hawkins, R. Heath, O. Hohn, E. Jones, N. Krevosheia, R. Lister, I. MacDonald, S. MacDonald, H. MacGregor, J. McIntyre, A. McPhalen, D. Milner, H. Pegg, P. Thompson, R. Turner, J. Williams.

Comox, B.C. (Courtenay, from upper river bridge along river bank to head of Comox Bay, side trips between Courtenay and Comox, taking in Park, much of farmed area around Comox Village to Village dump).—Dec. 29, 1957; 8 a.m. to 3.30 p.m.; temp. 34° to 42°; wind calm. Observers in 2 and 3 parties. Total party hours, approx 17 m.; car only from different points; total party miles, approx. 12.

Common Loon, 7; Red-throated Loon, 3; Red-necked Grebe, 3; Horned Grebe, 4; Western Grebe, 3; Double-crested Cormorant, 1; Pelagic Cormorant, 1; Cormorant

(sp. ?), 12; Great Blue Heron, 7; Mallard, est. 150+; Pintail, 1; Green-winged Teal, 27; Am. Widgeon, 250+; Greater Scaup, 200+; Common Goldeneye, 160; Bufflehead, 30; Oldsquaw, 2; White-winged Scoter, 450+; Surf Scoter, 1200+; Common Scoter, 9; Hooded Merganser, 1; Common Merganser, 4; Red-breasted Merganser, 2; Duck (sp. ?) 3000; Red-tailed Hawk, 2; Bald Eagle, 3; Ruffed Grouse, 2; Ring-necked Pheasant, 30; Am. Coot, 75; Killdeer, 12; Black Turnstone, 80; Glaucous-winged Gull, 300; Herring Gull, 7; Mew Gull, 36; Belted Kingfisher, 1; Red-shafted Flicker, 15; Pileated Woodpecker, 1; Hairy Woodpecker, 2; Downy Woodpecker, 5; Steller's Jay, 15; Common Raven, 9; Common Crow, 1; Northwestern Crow, 130; Chestnut-backed Chickadee, 81; Winter Wren, 20; Bewick's Wren, 11; Am. Robin, 28; Varied Thrush, 2; Golden-crowned Kinglet, 31; Ruby-crowned Kinglet, 2; Northern Shrike, 4; Starling, 25; MacGillivray's Warbler, 1; House Sparrow, 20; Brewer's Blackbird, 400; Purple Finch, 10; House Finch, 3; Pine Siskin, 165; Finch (sp. ?), 15; Rufous-sided Towhee, 30; Oregon Junco, 200; Fox Sparrow, 7; Song Sparrow, 52. Total, 60 species; 7,360+ individuals. (Seen in area during count period: Barrow's Goldeneye, Peregrine Falcon, Common Snipe, Dunlin, Snowy Owl, and Golden-crowned Sparrow).

D. Guthrie, J. and H. Haines, J. A. B. Paul, Theed Pearse (compiler).

Crescent Beach, B.C. (Coast and bush between Crescent Beach, Ocean Park and White Rock; Nicomekl River at Elgin; fields and roads between Port Kells and Trans Canada Highway).—Dec. 30, 1957; 7.45 a.m. to 3.30 p.m.; temp. 30° to 38°; wind NE, 10 m.p.h.; mostly overcast with fitful sunshine; visibility fair. 8 observers in 4 parties. Total party hours, 13 (12½ on foot, ½ by car); total party miles, 30 (20 on foot and bicycle, 10 by car).

Common Loon, 18; Red-necked Grebe, 3; Horned Grebe, 17; Eared Grebe, 2; Western Grebe, 12; Cormorant, (sp.) 2; Great Blue Heron, 10; Brant, 18; Mallard, 3; Pintail, 3; Greater Scaup, 39; Common Goldeneye, 9; Bufflehead, 28; Oldsquaw, 19; White-winged Scoter, 250+; Surf Scoter, 125+; Common Scoter, 6; Ruddy Duck, 6; Red-breasted Merganser, 17; Sharp-shinned Hawk, 1; Marsh Hawk, 1; Sparrow Hawk, 1; Am. Coot, 5; Killdeer, 11; Dunlin, 150; Glaucous-winged Gull, 230; Herring Gull, 100; Mew Gull, 3; Belted Kingfisher, 1; Red-shafted Flicker, 5; Pileated Woodpecker, 1; Hairy Woodpecker, 1; Steller's Jay, 2; Northwestern Crow, 67; Black-capped Chickadee, 43; Winter Wren, 2; Bewick's Wren, 1; Varied Thrush, 3; Golden-crowned Kinglet, 7; House Sparrow, 24; Brewer's Blackbird, 65; Purple Finch, 54; Pine Siskin, 175; Rufous-sided Towhee, 18; Oregon Junco, 80; White-crowned Sparrow, 7; Fox Sparrow, 1; Song Sparrow, 54. Total, 48 species; 1,745+ individuals. Raft of several thousand ducks out on Boundary Bay mostly mallard and pintail. (Dec. 28, 5 Black Turnstone seen at Crescent Beach; Dec. 31, Ruffed Grouse seen at Ocean Park).

H. N. Clarke, Rev. M. W. Holdom (compiler), Miss Elsie Osgood, Sister Theodora, Mrs. Kathleen Munro, Tom Stevens, (Sir) John Simeon (Bt.), Richard Simeon, E. E. Woodford.

Penticton, B.C. (Route followed lower half mile of Trout Creek and adjacent beaches on Okanagan Lake, thence south along west side of Okanagan Lake to Penticton and along south shore to east side of lake; route then followed highway to Vassaux Lake via Kaleden and old road overlooking Skaha Lake).—Dec. 28, 1957; 9.30 a.m. to 3.30 p.m.; temp. 35° to 45°; cloudy, sunny periods in a.m.; no snow; no ice on lakes. 2 observers together. Total party miles, 34 (3 on foot, 31 by car); total party hours, 4½ (2½ on foot, 2 by car).

Horned Grebe, 2; Canada Goose, 60+; Mallard, 10; Redhead, 5; Canvasback, 6; Bufflehead, 13; Hooded Merganser, 1; California Quail, 10; Am. Coot, 900+; Herring Gull, 2; Red-shafted Flicker, 6; Lewis Woodpecker, 1; Downy Woodpecker, 1; Black-billed Magpie, 3; Black-capped Chickadee, 6; Golden-crowned Kinglet, 2; Northern Shrike, 1; English Sparrow, 25; Oregon Junco, 16; Song Sparrow, 3. Total, 20 species; 1,073 individuals.

S. R. Cannings, R. A. Cannings.

Vancouver, B.C. (7½-mile radius centering on Broadway West and Granville Street, including the City of Vancouver, North Vancouver, parts of the Municipalities of Burnaby, West Vancouver and Richmond, part of Burrard Inlet and North Arm of the Fraser

River).—Salt water 30%; shores 3%; marsh 3%; open fields 10%; built up areas 40%; city parks 7%; coniferous forests 7%).—Dec. 26, 1957; 7.45 a.m. to 5 p.m.; temp. 42° to 47°; wind W 15 decreasing to 2 m.p.h.; sunny a.m.; light clouds forming late p.m. 37 observers in 13 parties. Total party hours, 92½ (67½ on foot, 25 by car); total party miles, 87½ (43½ on foot, 44 by car).

Common Loon, 14; Arctic Loon, 55; Red-throated Loon, 16; Red-necked Grebe, 24; Horned Grebe, 179; Eared Grebe, 27; Western Grebe, 491; Pied-billed Grebe, 2; Double-breasted Cormorant, 70; Pelagic Cormorant, 62; Great Blue Heron, 39; Canada Goose, 31; Mallard, 706; Shoveler, 15; Pintail, 238; Green-winged Teal, 7; Am. Widgeon, 270; Wood Duck, 14; Canvasback, 4; Greater Scaup, 2,942+; Lesser Scaup, 5; Common Goldeneye, 271; Barrow's Goldeneye, 637; Bufflehead, 178; Oldsquaw, 16; Harlequin Duck, 13; White-winged Scoter, 295; Surf Scoter, 1,196; Common Scoter, 188; Ruddy Duck, 42; Hooded Merganser, 19; Common Merganser, 5; Red-breasted Merganser, 390; Sharp-shinned Hawk, 5; Cooper's Hawk, 2; Red-tailed Hawk, 6; Bald Eagle, 7; Marsh Hawk, 10; Peregrine Falcon, 3; Sparrow Hawk, 3; Ring-necked Pheasant, 64; Am. Coot, 391; Killdeer, 191; Common Snipe, 17; Black Turnstone, 131; Dunlin, 1,931+; Sanderling, 397; Glaucous-winged Gull, 15,231+; Herring Gull, 370; Mew Gull, 5,380+; Bonaparte's Gull, 380; Common Murre, 47; Pigeon Guillemot, 36; Marbled Murrelet, 91; Ancient Murrelet, 2; Short-eared Owl, 13; Belted Kingfisher, 17; Red-shafted Flicker, 291; Pileated Woodpecker, 3; Yellow-bellied Sapsucker, 2; Hairy Woodpecker, 2; Downy Woodpecker, 7; Steller's Jay, 41; Common Raven, 7; Northwestern Crow, 480; Black-capped Chickadee, 391; Chestnut-backed Chickadee, 211; Red-breasted Nuthatch, 18; Brown Creeper, 12; Winter Wren, 31; Bewick's Wren, 17; Long-billed Marsh Wren, 3; Am. Robin, 3,911+; Varied Thrush, 231; Golden-crowned Kinglet, 247; Ruby-crowned Kinglet, 193; Bohemian Waxwing, 42; Cedar Waxwing, 648; Northern Shrike, 12; Starling, 14,653+; Crested Mynah, 71; House Sparrow, 580; Western Meadowlark, 49; Red-winged Blackbird, 161; Brewer's Blackbird, 1,120; Orange-crowned Warbler, 2; Evening Grosbeak, 411; Purple Finch, 632; House Finch, 296; Common Redpoll, 5; Pine Siskin, 1,122+; Rufous-sided Towhee, 71; Slate-colored Junco, 14; Oregon Junco, 683; White-crowned Sparrow, 154; Golden-crowned Sparrow, 87; Fox Sparrow, 14; Lincoln's Sparrow, 2; Song Sparrow, 492. Total, 99 species; 60,605+ individuals.

R. Drent, A. J. Erskine, F. J. Sandford, A. Muir, Violet Mackay, J. Ross Mackay, G. McKay, W. L. Merilees, Bill Merilees, S. F. Bradley, Dorothy Bradley, Evelyn Wright, C. Wright, Col. Wm. Bird, Gwen Wright, Rosamond Ross, R. Webber, H. Mulder, J. G. Sarles, E. Moodie, Sheila Buchanan, Verna Newson, Hilda Hesse, W. H. Hesse, L. N. Precious, Margaret McFeat, Heather Leveson-Gower, Inga Perkin, G. S. Stevens, Mrs. G. S. Stevens, Janis Stevens, Foote Waugh, Mary Alice Foote Waugh, Noela Waugh, J. Bain, Mrs. J. Bain, Wm. M. Hughes (compiler).

Vernon, B.C. (North to Buckerfield's Ranch; west to Okanagan Landing; south to Rattlesnake Point (Kalamalka Lake); east to Coldstream Ranch).—Dec. 22, 1957; 8.30 a.m. to 3.30 p.m.; temp. 28° to 38°; wind S, 5 to 15 m.p.h.; Okanagan and Kalamalka Lakes clear of ice; Swan Lake mostly frozen over; one inch of snow. 20 observers in 4 parties. Total party hours, 25; total party miles, 120 (25 on foot, 95 by car).

Common Loon, 2; Red-necked Grebe, 1; Horned Grebe, 2; Great Blue Heron, 8; Mallard 116; Green-winged Teal, 2; Am. Widgeon, 97; Shoveler, 6; Redhead, 35; Ring-necked Duck, 14; Lesser Scaup, 39; Common Goldeneye, 3; Barrow's Goldeneye, 4; Goldeneye sp., 8 (females or immature); Bufflehead, 8; Hooded Merganser, 3; Common Merganser, 9; Goshawk, 1; Cooper's Hawk, 1; Golden Eagle, 4; Ring-necked Pheasant, 180; Gray Partridge, 31; California Quail, 15; Am. Coot, 87; Killdeer, 8; Common Snipe, 9; Herring Gull, 2; Rock Dove, 40+; Mourning Dove, 2; Short-eared Owl, 3; Belted Kingfisher, 2; Red-shafted Flicker, 27; Pileated Woodpecker, 2; Hairy Woodpecker, 3; Downy Woodpecker, 6; Horned Lark, 11; Steller's Jay, 5; Black-billed Magpie, 109; Common Raven, 7; Clark's Nutcracker, 2; Black-capped Chickadee, 63; Mountain Chickadee, 11; Chestnut-backed Chickadee, 1; White-breasted Nuthatch, 3; Pygmy Nuthatch, 20; Brown Creeper, 1; Am. Dipper, 2; Winter Wren, 1; Am. Robin, 3; Townsend's Solitaire, 2; Golden-crowned Kinglet, 11; Bohemian Waxwing, 307; Cedar Waxwing, 15; Northern Shrike, 12; Starling, 72; House Sparrow, 450; Western Meadowlark, 103; Brewer's Blackbird, 20; Evening Grosbeak, 145; Cassin's Finch, 15; Pine Grosbeak, 9; Hoary Redpoll, 10; Common

Redpoll, 965; Pine Siskin, 84; Am. Goldfinch, 222; Slate-colored Junco, 2+; Oregon Junco, 464; Tree Sparrow, 5; White-crowned Sparrow, 11; Song Sparrow, 47; Snow Bunting, 1. Total, 70 species; 3,991 individuals. (Seen during period: Whistling Swan, 2; Sharp-shinned Hawk, 1; Gyrfalcon, 1; Sparrow Hawk, 2; Hawk Owl, 1; Common Crow, 120; Redwinged Blackbird, 2; Rufous-sided Towhee, 2).

J. Arrand, Miss K. Bartholomew, J. B. Beddome, Mrs. K. Dobson, J. T. Fowle, J. Grant (compiler), J. V. Holms, A. N. Humphreys, Rev. A. C. Mackie, J. Y. Obana, Mrs. T. Pickering, D. Quirk, J. R. Quirk, D. A. Ross, I. Ross, Miss S. Ross, D. H. Ruppel, B. A. Sugden, E. Van Blaricom, E. P. Venables.

Victoria, B.C. (Sea front, woods, bush land, cultivated fields, flooded fields and small lakes; Victoria and Saanich peninsula within 20-mile radius of center of town).—Dec. 28, 1957; 8.30 a.m. to 4.30 p.m.; temp. 43°; wind SW, 20-50 m.p.h.; heavy squalls, rain and hail, partly fine. 16 observers in 8 parties. Total party hours, 48 (38 on foot, 10 by car); total party miles, 45 (15 on foot, 30 by car).

Common Loon, 23; Arctic Loon, 6; Red-throated Loon, 2; Red-necked Grebe, 20; Horned Grebe, 184; Eared Grebe, 62; Western Grebe, 98; Pied-billed Grebe, 4; Double-crested Cormorant, 5; Pelagic Cormorant, 173; Great Blue Heron, 9; Canada Goose, 62; Mallard, 1,415; Pintail, 1,088; Green-winged Teal, 384; Am. Widgeon, 4,368; Shoveler, 1,680; Wood Duck, 3; Ring-necked Duck, 1; Canvasback, 73; Greater Scaup, 676; Common Goldeneye, 88; Bufflehead, 600; Oldsquaw, 66; Harlequin Duck, 75; White-winged Scoter, 105; Surf Scoter, 86; Common Scoter, 8; Ruddy Duck, 210; Hooded Merganser, 18; Common Merganser, 6; Red-breasted Merganser, 55; Sharp-shinned Hawk, 2; Cooper's Hawk, 2; Red-tailed Hawk, 3; Bald Eagle, 1; Sparrow Hawk, 1; California Quail, 83; Ring-necked Pheasant, 39; Am. Coot, 342; Black Oystercatcher, 37; Killdeer, 83; Black Turnstone, 135; Common Snipe, 6; Dunlin, 61; Glaucous-winged Gull, 2,755; Herring Gull, 56; Mew Gull, 778; Pigeon Guillemot, 7; Marbled Murrelet, 10; Ancient Murrelet, 1; Rock Dove, 15; Belted Kingfisher, 4; Red-shafted Flicker, 49; Pileated Woodpecker, 3; Lewis's Woodpecker, 2; Hairy Woodpecker, 2; Downy Woodpecker, 2; Skylark, 116; Steller's Jay, 37; Common Raven, 4; Northwestern Crow, 824; Chestnut-backed Chickadee, 148; Common Bushtit, 24; Red-breasted Nuthatch, 4; Brown Creeper, 14; Winter Wren, 7; Bewick's Wren, 14; Am. Robin, 1,119; Varied Thrush, 90; Hermit Thrush, 2; Golden-crowned Kinglet, 80; Ruby-crowned Kinglet, 4; Water Pipit, 87; Cedar Waxwing, 47; Northern Shrike, 1; House Sparrow, 137; Western Meadowlark, 51; Redwinged Blackbird, 465; Brewer's Blackbird, 566; Purple Finch, 61; House Finch, 61; Pine Siskin, 223; Rufous-sided Towhee, 71; Oregon Junco, 447; White-crowned Sparrow, 6; Golden-crowned Sparrow, 82; Fox Sparrow, 19; Song Sparrow, 67. Total, 88 species; 21,010 individuals. (Seen within 24 hours of census date: Black-bellied Plover, 25; Bonaparte's Gull, 5; Rock Sandpiper, 12; Surfbird, 2; Lesser Yellowlegs, 1; Am. Goldfinch, 2).

Mrs. H. W. S. Soulsby, Mrs. H. M. S. Bell, Miss E. K. Lemon, Mrs. G. J. Jackson, Mrs. Eleanor McGavin, Miss M. C. Melburn, Miss Leila Roberts, Mrs. W. L. Taylor, Mrs. J. A. Sherman, Ray Beckett, J. O. Clay (compiler), P. Symons, Ralph Fryer, A. R. Davidson, A. Poynter, H. Wotton.

CORRECTION TO 1956 CENSUS

In the report for Comox, B.C. (Can. Field Nat. 71:26. 1957) Eared Grebe should read Horned Grebe.

FINANCIAL STATEMENT OF THE OTTAWA FIELD-NATURALISTS' CLUB, DEC. 2, 1957

CURRENT ACCOUNT

ASSETS		LIABILITIES	
Balance in Bank, Dec. 2/57.....	\$1,649.13	Audubon Screen Tours, guarantee. \$	750.00
Bills receivable.....	236.94	Cheques outstanding.....	79.70
Lodge, estimated value.....	120.00	Balance.....	1,176.37
	<u>\$2,006.07</u>		<u>\$2,006.07</u>
RECEIPTS		EXPENDITURES	
Balance in Bank, Nov. 29/56....	\$3,043.87	Can. Field Nat. (8 numbers)....	\$4,038.45
Fees:		Illustrations.....	709.45
Current.....	\$1,577.74	Separates.....	444.84
Advance.....	214.79	Editors' honoraria.....	300.00
Arrears.....	952.49	Business Manager's honorarium..	15.00
Associate.....	32.00	Postage and Stationery.....	410.99
	<u>2,777.02</u>	Extra cost Wilson Geology.....	1,087.20
Separates and illustrations.....	508.39	Excursions and Lectures Comm...	100.00
Single and Back Numbers.....	788.13	Newsletter (3 numbers).....	97.62
Sale Wilson Geology.....	1,120.30	Bank discount.....	36.19
Sale Macoun Biography.....	11.15	Foreign exchange.....	55.85
Donations.....	25.00	Miscellaneous.....	84.32
From Publication Fund.....	300.00	Balance in Bank,	
Miscellaneous.....	4.50	Dec. 2/57.....	\$1,649.13
Audubon Tours (net).....	370.98	less o/s cheques.....	79.70
	<u>\$8,949.34</u>		<u>1,569.43</u>
			<u>\$8,949.34</u>

RESERVE FUND

ASSETS		LIABILITIES	
\$3,000 Ontario Hydro 3% bonds,			
Market value.....	\$2,605.00		
13 shares Bell Telephone stock,			
Market value.....	520.00		
Balance in Bank, Dec. 2/57.....	175.33		
	<u>\$3,300.33</u>		
RECEIPTS		EXPENDITURES	
Balance in Bank, Nov. 29/56....	\$ 134.75	Rent safety deposit box.....	\$ 5.00
Bank interest.....	3.46	Purchase 2 shares Bell Telephone.	68.00
Bond interest.....	90.00	Purchase 3 Rights Bell Telephone.	2.88
Dividend Bell Telephone.....	23.00	Balance in Bank, Dec. 2/57.....	175.33
	<u>\$ 251.21</u>		<u>\$ 251.21</u>

PUBLICATIONS FUND

ASSETS		LIABILITIES	
\$1,500 Ontario Hydro 3% bonds,			
Market value.....	\$1,297.50		
Balance in Bank, Dec. 2/57.....	152.41		
	<u>\$1,449.91</u>		
RECEIPTS		EXPENDITURES	
Balance in Bank, Nov. 29/56....	\$ 398.75	To Current Account.....	\$ 300.00
Bank interest.....	8.66	Balance in Bank, Dec. 2/57.....	152.41
Bond interest.....	45.00		
	<u>\$ 452.41</u>		<u>\$ 452.41</u>

Audited and found correct.

Dec. 2, 1957.

(Signed) C. FRANKTON
I. L. CONNORS
Auditors.

(Signed) R. J. MOORE
Treasurer.

REPORT OF COUNCIL AT THE SEVENTY-NINTH ANNUAL MEETING OF THE OTTAWA FIELD-NATURALISTS' CLUB, DECEMBER 6, 1957

SINCE the last Annual Meeting there were four meetings of Council: December 13, 1956, at St. Patrick's College, with 16 members present; February 7, 1957, at the National Museum of Canada, with 16 members present; September 30, 1957, at the National Museum of Canada, with 16 members present; November 12, 1957, at the National Museum of Canada, with 17 members present.

Appointments were made for 1957 as follows:

Editor of the *Canadian Field-Naturalist*—Mr. R. A. Hamilton
Business Manager of the *Canadian Field-Naturalist*—Mr. W. J. Cody
Chairman of the Publications Committee—Dr. J. W. Groves
Chairman of the Excursions and Lectures Committee—Dr. Winston Sinclair
Chairman of the Reserve Fund Committee—Mr. Hoyes Lloyd
Chairman of the Special Lectures Committee—Dr. E. L. Bousfield
Chairman of the Membership Committee—Mr. W. J. Cody
Chairman of the Bird Census Committee—Dr. D. B. O. Savile
Chairman of the Macoun Field Club Committee—Dr. J. S. Bleakney
Chairman of the F.O.N. Affairs Committee—Mr. Rowley Frith
Representatives, Canadian Section, International Committee for Bird Preservation—Mr. W. E. Godfrey, Dr. D. A. Munro

REPORT OF THE PUBLICATIONS COMMITTEE

Since December 1, 1956, the following numbers of the *Canadian Field-Naturalist* have been published: Vol. 69, No. 4; Vol. 70, Nos. 1-4; Vol. 71, Nos. 1-3. Vol. 71, No. 4 is expected to appear about the middle of December. Papers, notes and reviews were distributed as follows:

	<i>Papers</i>	<i>Notes</i>	<i>Reviews</i>
Anthropology	2		
Botany	6	1	3
Geology	1		1
Herpetology	1	3	3
Ichthyology	1	1	1
Invertebrate Zoology	3	5	3
Mammalogy	6	6	4
Ornithology	12	35	13
Miscellaneous	5	2	11

This comprises a total of 453 pages exclusive of the index of Vol. 71, with 67 maps and illustrations. The account of the geology of the Ottawa District was published as Vol. 70, No. 1. Large prepublication orders were received from Carleton College and the Geological Survey. The cost of publication of the 4000 copies printed has been covered by sales to date. It is planned to canvass business firms to obtain advertising for aid in publication costs. Sales of back numbers totaled \$555.39, exclusive of sales of Vol. 70, No. 1.

REPORT OF THE EXCURSIONS AND LECTURES COMMITTEE

Business dealt with by the committee during the year included arrangement of a program of outings, production of the Newsletter, the management of the

Study Groups, arrangement of the Annual Dinner, and finances of the committee.

Three excursions were held in May to the Lodge, Rockland, and Pakenham. One trip was held in the fall, to the Lake Fortune Parkway. Four early morning bird walks were conducted by the Bird Group in May.

The Annual Dinner at the Central Experimental Farm in April attracted a large group of members and their friends. The display there of the work of the Macoun Field Club drew many favorable comments.

The Newsletter, edited by Mr. and Mrs. Kenneth Bowles, continues to serve local members, with informal notes on natural history and news of Club activities.

REPORT OF THE RESERVE FUND COMMITTEE

The only change reported for the year was the purchase of two additional shares of Bell Telephone stock by the Treasurer upon authorization of the Committee.

REPORT OF THE SPECIAL LECTURES COMMITTEE

Three Audubon Screen Tours completed the 1956-57 series:

January 26—Alberta, by Dick Bird.

February 23—Rocky Mountain Rambles, by Emerson Scott.

April 4—Kangaroo Continent, by Alfred M. Bailey.

The following lectures of the tenth season complete the program for 1957:

October 15—A Touch of the Tropics, by William H. Wagoner.

November 28—Ranch of the Purple Flowers, by Robert C. Hermes.

REPORT OF THE MEMBERSHIP COMMITTEE

The responsibility of this Committee is to seek new members and subscribers to the *Canadian Field-Naturalist* from outside the Ottawa District. With publication of the *Naturalist* now up to date, steps have been taken to build up a file of names of naturalists to whom membership information might be sent for use of the 1958 Committee. In October letters were sent to the Manitoba Natural History Society, Saskatchewan Natural History Society and the Federation of Ontario Naturalists asking for lists of members. A favorable reply has already been received from Saskatchewan, and the F.O.N. has offered to enclose an O.F.-N.C. brochure with their bulletin. Three thousand of the newly printed brochures have been sent to the F.O.N. headquarters, and two thousand to other institutions.

REPORT OF THE BIRD CENSUS COMMITTEE

A very successful 1956 Christmas Bird Census was reported, 6879 individual birds being counted, representing 33 species. The Christmas Bird Census for all of Canada was published in Vol. 71, No. 1, of the *Canadian Field-Naturalist*.

REPORT OF THE MACOUN FIELD CLUB COMMITTEE

The Macoun Field Club is now in its ninth year, with sixty active members distributed almost equally among the Junior, Intermediate and Senior Groups. Weekly meetings were held at the National Museum on Tuesdays for the Seniors and on Saturdays for the Juniors and Intermediates. As in previous years, Saturday morning field hikes were held in the winter, spring and fall, and the club members greatly appreciated the transportation and supervision provided by O.F.-N.C. members and the National Museum.

In 1957, there were eighteen indoor meetings and seven hikes. On April 25 the children set up a display at the annual banquet of the O.F.-N.C. The

annual Macoun Field Club birthday party was held on April 27. Badges were presented to new members on this occasion and prizes awarded to the Junior and Intermediate winners of the attendance and merit game. Parents and other guests then viewed displays and enjoyed the birthday cake provided by the girls in the Senior group. The club room has been renovated and the library augmented by the purchase of new charts, books and leaflets. Other club activities included publication of two issues of the *Little Bear*, edited by Mr. Herbert Groh, ushering by the Seniors at the Audubon Screen Tours, and the election of new officers in October. The new presidents in the groups are Hugh Scoggan for Juniors, John Scoggan for Intermediates, and Pierre Taschereau for the Seniors.

The members are looking forward to a new series of interesting talks and demonstrations and, in company with the Committee, wish to thank in particular Mr. Herbert Groh, Mr. D. C. Maddox and Mr. High Thompson for invaluable assistance at meetings and in other ways.

NOTICE OF MOTION

Notice of Motion having been given at the Council Meeting of September 30, it was moved and carried on division at the Council Meeting of November 12 that the active membership and subscription fees of the Ottawa Field-Naturalists' Club be increased from \$3.00 to \$4.00 per annum, effective in 1959, and that the associate membership fee be increased from \$1.00 to \$2.00, effective in 1959.

L. S. Russell, *President* H. J. Scoggan, *Secretary*

REVIEWS

A Flora of the Marshes of California

By HERBERT L. MASON. Berkeley, University of California Press, 1957. 878 p., illus. \$10.00.

Keeping abreast of the demands of applied biology for technical publications in the cognate fields is a real challenge to the pure scientist. As one of the world's foremost taxonomists, Professor Mason, seeing the need for a precise work on the botany of aquatic plants, has now provided a most complete and competent guide for the particular use of experts in wildlife management and conservation.

His book describes nearly a thousand different species of marsh plants which, for the purpose, are defined as all plants growing in wet soil or in water. Species of this ecological group are representative of almost all plant families, horse-tails, cattails, pondweeds, arrowheads, sedges, grasses, rushes, duckweeds, iris, willows, polygonums, goosefoots, water-lilies, buttercups and so on through the System to the composites, beggar-ticks and cockleburrs. The main portion of the

text is therefore taken up with the detailed description of these selected representatives of the great plant assemblages, with keys for their identification, habitat notes and pertinent citations. A short introductory chapter and an illustrated glossary complete the text.

Well over one third of the species are illustrated in the 358 full-page drawings which, one will quickly recognize, have unusual botanical as well as artistic merit. They are all line drawings, finely executed and superbly reproduced, and show a habit sketch of the whole plant with enlarged detail of the critical parts of leaves, flowers or fruits. The parts are often repeated to show the degree of variability found in nature. Seeds are always shown because these are especially important in the wild food aspects of game management.

As might be expected in the preparation of a work of such magnitude, the author has had the assistance of his various students and associates at the University of California in the construc-

tion of the drawings, in the preliminary field work, and likely in assembling parts of the text. The author has paid particular attention to nomenclature and matters of classification. In doing so he has followed a rather conservative line, preferring to side-step taxonomic issues, pointing out rather the difficulties or discrepancies in current concept or observation and referring the problems for further study, a realistic attitude which reflects systematic discretion and consideration of his readers.

The terminology in descriptions and keys is as simplified as it can be and still is sufficiently precise to suit the requirements of the intended users. The drawings, made for living material, reveal some things not usually known to herbarium workers, and depict the plants as the field worker will encounter them. The manual will have wide application far beyond the limits of California, and wildlife biologists, botanists and serious naturalists everywhere will require it for ready and frequent reference.

W. G. DORE

The Distribution of Minnesota Minnows and Darters in Relation to Pleistocene Glaciation

By JAMES C. UNDERHILL. Minneapolis, Museum of Natural History, University of Minnesota, 1957. 45 p. (Occasional Papers, No. 7).

Distribution of fish is not the result of chance. The occurrence or absence of a given species in a given drainage area may be associated with many complex and interrelated factors such as tolerance of individuals of a species to the physico-chemical characteristics of the environment, suitability of habitat for all phases of fish life history and adaptability of individuals to environment.

James C. Underhill discusses the distribution of two families of small fishes in Minnesota waters. The occurrence of forty-one species of minnows and fifteen species of darters collected in Minnesota has been plotted on maps and the distribution discussed.

The author relates the distribution of these fishes to Pleistocene glaciation as it affected the three basins in Minnesota: the Mississippi and Red rivers and Lake

Superior drainage. Species are grouped according to their time of arrival into the three basins as dispersal routes opened to fish and as suitable conditions were met throughout the ages. Eighteen species of minnows and darters are grouped together as early arrivals because they are common to all basins. Most of these species have a wide distribution range north in Canadian waters. Underhill disagrees with Isobel Radforth in explaining the distribution of fish on the basis of isotherms. Too little is known of the life histories and specific requirements of fish to enable an adequate discussion of ecological factors as they may limit the distribution of fish. More basic research is required on species of minnows and darters, for example, in order to provide a solution to such fundamental problems.

The author would have helped the reader who might not be very familiar with local geological events if he had included maps of the areas of Minnesota covered by the Mankato ice and Lake Grantsburg, and by showing, for example, connections between rivers and basins during late and postglacial times.

The thesis is well documented with a list of more than seventy references. The reading of this publication, free of typographical errors, is most interesting.

J. P. CUERRIER

The Warblers of North America

By LUDLOW GRISCOM, ALEXANDER SPRUNT, Jr., and others. Ill. by John Henry Dick. New York, Devin-Adair Co., 1957. 356 p. \$15.00.

This book undoubtedly fills a need in the literature of ornithology, chiefly because the large Family of the American Wood Warblers (*Parulidae*) still remains a vast field for diligent and painstaking research. To encourage such research a practical way is, of course, to produce a compilation, such as this one, of hitherto known data, set forth with professional as well as popular appeal and indicating at the same time to the enterprising student the yet undiscovered premises. To this effect a number of our best known ornithologists co-operated under the editorship of Ludlow Griscom and Alexander Sprunt, Jr., bringing about this, on the whole, successful effort.

The handsomely turned out volume begins with a publisher's preface which explains, among other things, the discrepancy that cannot escape notice between the title of the book and the one on the jacket. Tribute is duly paid to all the contributors, including those whose names for unexplained reasons are omitted from the list on the jacket.

Probably not without intention Alexander F. Skutch's fine article on the Warbler Family in general introduces the discussions. Here the accumulated knowledge of our perhaps most outstanding and skillful observer of birds' behavior and breeding rhythms, provides us with a résumé of the life history data of the Wood Warblers. Later, when the reader discovers the lack of these significant facts, this chapter proves of much value as one to which he can return for the information he finds missing in so many of the descriptions of the species.

Griscom's discussions on the classification of warblers and the techniques of warbler study are highly informative and delivered in a clear and readable style. The amateur and the beginner students, especially, benefit thereby since the author, with his inimitable zest, wit, and erudition, succeeds in gripping the reader with these subjects, that can appear very dry and remote, so that he vividly realizes their importance and purposes. None better than Mr. Griscom, who is rightly considered America's top field ornithologist, can propound the essentials of good field work, although his techniques for the most part limit themselves to the matters of identification and the interpretation of occurrence data. Characteristic is his emphasis on bird counts, precise daily and seasonal counts of individuals carefully recorded, as the only sure and revealing basis for research on migration routes and distribution.

Two chapters are devoted to the songs of the warblers. One of these, and I think the most significant, is based on W. W. H. Gunn's and Donald J. Borror's remarkable work with tape recordings. The songs of 39 species are here analyzed, their duration given, and their notes aptly rendered in phonetics.

An unusual and helpful chapter is on

the foraging ranges. It gives a comparative table of the species and their preferences for low, medium, and high levels of the forest growth.

General notes, an explanation of the Latin names, which is interesting to many, field characters, short nesting data, voice, food habits, and distribution, compose the descriptions of each species. The paucity of good life history data is, with few exceptions, striking. Among the exceptions are all Walkinshaw's contributions, especially that on the Prothonotary (*Protonotaria citrea*) which should have been the model of all the others, those of Skutch, which with his fine literary style and substance are hard to match, Gunn's on the Tennessee (*Vermivora peregrina*), Griscom's on the Cerulean (*Dendroica cerulea*), Oberholser's on the Bay-breasted (*Dendroica castanea*), and Weston's on the Pine Warbler (*Dendroica pinus*). The assignment of so many 'northern' warblers to an author whose experience lies almost entirely with the southern species is unfortunate. From this circumstance suffer especially the Northern Waterthrush (*Seiurus noveboracensis*), the Blackburnian (*Dendroica fusca*), and the Magnolia (*Dendroica magnolia*) Warblers. Most of what has been written on many of these species is ignored. In several cases, with the warblers nesting in the author's garden, one wonders why not a single original item is produced on the behavior and rhythms of these birds. The use of range maps, adopted recently by many works of this kind, is of value, but those here reproduced would have gained on the printing having been finer and more precise. A few inaccuracies, as noted, in the description of the ranges and distribution are perhaps unavoidable.

Eleven chapters deal with the occurrence, migration, and the differences in behavior of resident and migratory warblers, in the regions north and south of the United States. Despite a certain amount of repetitiousness, these discussions afford many pages of valuable and interesting information. Such are the sections on the influence of the evolution of the land and its topography in relation to the movements and distribution of the

birds, especially noteworthy in the accounts about Panama and British Columbia, and on the timing of the resident tropical warblers' breeding season which is dependent upon the departure northwards of the migrants and the release of larger food supplies caused by their exodus, to mention but two examples. In Clement's and Gunn's excellent concluding article on the warblers in Eastern Canada we gain insight into the ecological relationships between the warblers and their plant world, their niche requirements, and how these affect their distribution, a fascinating and all-important aspect in the study of the birds. We are told that on the estimated basis of each acre being occupied by one pair of warblers, representing the apparent density of their populations, the vast forested land from the Manitoba border eastwards harbor during the summer something like 350 million pairs.

Biographical notes on the contributors, three appendices, and an index to the warblers, conclude the volume. The lack of a complete list of references is doubtless an editorial error and a rather surprising omission in view of the book's pretention to being an authority. In some places direct quotations are not even so marked.

Lastly a word on the illustrations which are generously scattered throughout the volume. In his 45 pen drawings and 35 colored plates the young American artist, John Henry Dick, shows fine artistic sense and delicacy. Increased experience will enable him to infuse his lovely birds with more life and movement, an animation that would have enlivened many of those exquisite scenes against which he chose to create them.

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Webster's New International Dictionary is the authority for spelling.

References are made by the author-date system. They should be listed alphabetically and typed at the end of the main body of text. For titles in reference matter, abbreviations follow the rules in the *International Code for the Abbreviation of Titles of Periodicals* and the *World List of Scientific Periodicals*.

Other abbreviations should be used sparingly. The better-known terms of measurement follow CSA Specification Z85-1943 *Abbreviations for Scientific and Engineering Terms* or the equivalent of the American Standards Association (Z10.1-1941).

Tables should be titled and numbered consecutively in arabic numerals. Tables and legends for the figures should be placed after the list of references. Each table and all the legends should be on separate pages.

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FRESH-WATER AMPHIPOD CRUSTACEANS OF GLACIATED NORTH AMERICA

E. L. BOUSFIELD

National Museum of Canada, Ottawa, Ontario

THE present account treats systematically 30 species and subspecies of amphipodous crustaceans from epigeal fresh waters of Canada and contiguous areas of the United States that have been exposed to Pleistocene glaciation*. Twenty-two of these are herewith recorded from Canada of which eleven (*Pontoporeia affinis* Lindstr., *Gammarus fasciatus* Say, *G. duebeni* Lillj., *G. lacustris* Sars, *G. l. limnaeus* Smith, *Crangonyx gracilis* Smith, *Anisogammarus ramellus* (Weckel), *A. confervicolus* (Stimpson), *A. locustoides* (Brandt), *Hyaella azteca* (Sauss.) and *Corophium spinicorne* (Stimpson)) were previously known, three (*Gammarus tigrinus* Sexton, *Crangonyx richmondensis* Ellis and *C. r. occidentalis* H. & H.) are new to the region, and eight (*Paramoera columbiana*, *P. carlottensis*, *Gammarus pseudolimnaeus*, *Crangonyx rivularis*, *C. setodactylus*, *C. minor*, *C. pseudogracilis*, and *C. richmondensis laurentianus*) are new to science. The genus *Paramoera* and family Pontogeniidae are new to the fresh waters of North America.

The pertinent literature dates from 1818 when Thomas Say described *Gammarus fasciatus*, *G. minus*, and "*Ampithoe dentata*" from fresh waters of eastern United States. Further serious work was not attempted until Smith (1871 and following) described *Gammarus limnaeus*, *Crangonyx gracilis*, and *Hyaella dentata* from the Great Lakes and Rocky Mountain regions. Weckel's comprehensive treatment of North American species (1907) included redescrptions of poorly known species and the addition of *Anisogammarus ramellus* to the epigeal or surface-water forms. The records of Huntsman (1915) and Johansen (1920 and following) extended considerably the ranges of amphipods in fresh waters of Canada. Major contributions were made by Hubricht and Mackin (1940) with the description of *Gammarus troglophilus*, *G. acherondytes*, *Crangonyx forbesi*, *C. obliquus*, and *C. shoemakeri*; by Hubricht (1943) with the addition of *Crangonyx anomalus* and a number of new subterranean species; and by Shoemaker (1942) with keys to the families, subfamilies, genera, and subgeneric groups, and detailed descriptions of new and little-known subterranean forms. These and a number of lesser publications have contributed much to our knowledge of the taxonomy, general biology, and economic importance of the North American species, all of which have been summarized most usefully in Pennak (1953).

*Exclusive of obligate-subterranean forms which, almost without exception, occur south of the study region.

Mailing date of this number: 30 May 1958

CORRECTION

The illustration on page 101 goes with the legend on page 104. The illustration on page 104 should appear on page 101.

Despite these notable contributions, knowledge of the group is far from complete. The present investigation was necessitated primarily by the accumulation of large collections of unstudied material and the new records, new forms, and range extensions contained therein. Furthermore, recent advances in amphipod systematics emphasizing the diagnostic importance of spines and setae (namely, the European group of Bazikalova, 1945; Segerstrale, 1947; Gurjanova, 1951; Kinne, 1954; Carausu, 1943; and others) have made necessary the re-examination and redescription of type and topotype material of earlier species, and a re-appraisal of the North American literature. The animals are generally regarded as taxonomically difficult; the genitalia are not of systematic significance, or if so, not readily utilized, and reliance must be placed on somewhat obscure and more variable characters. The high degree of variability between individuals and between successive instars, the pronounced sexual dimorphism, and the overlapping of ranges, both ecologically and geographically, tend to mask the certain separation of closely related species. The writer has presently endeavored to provide bases for the recognition of genetically distinct populations in the group. Further taxonomical refinements comparable to those presently accepted in decapod crustaceology and ornithology should provide a still more realistic approach to this end.

With respect to probable origin, the North American fresh-water amphipod fauna may be classified in two main groups: (1) those of ancient fresh-water lineage, having no morphologically close marine relatives, and (2) those of relatively recent marine origin. The first (and largest) group contains the *Crangonyx* section of Gammaridae, represented in epigean waters by the primarily American-endemic genus *Crangonyx* and the essentially Palaearctic genus *Synurella*, and in subterranean waters by an even larger number of American-endemic genera and species. This group occurs mainly in the east-central United States. Parts of this region have evidently not been glaciated nor inundated by the sea since the Palaeozoic era and are today characterized by well-developed underground drainage systems. During the Mesozoic and most of the Cenozoic, many of the *Crangonyx* group were probably distributed throughout the region that is now Canada, at least in its southern portions. However, they would have been obliterated or forced southwards by the destruction of surface and subsurface drainage systems during Pleistocene glaciation (see Hitchcock, 1949). In recent times, several of the hardier surface-water forms have followed the retreating glacier northwards, some apparently to the limit of hard-water drainage basins, high water tables, and/or prolonged winter freezing, but a few have invaded the soft-water Precambrian Shield and boreal forest regions. A small number of the *Crangonyx* group have been isolated from the main group on the Pacific slope by the locally glaciated and ecologically unsuitable watersheds of the Rocky Mountains, and by the arid climate and seasonal extremes of temperature of the midwestern plains. The Eurasian counterpart of *Crangonyx* would appear to be the large Palaearctic genus *Niphargus* (for distribution maps, etc., see Carausu, 1943).

The marine-derived group is further separable into species which are able to tolerate salt and brackish water and are closely related to modern marine

species, and those which are typically unable to tolerate salt water but have close affinities with littoral marine forms at the generic and subgeneric level. The first group is represented on the Pacific coast by species of *Anisogammarus* (*Eogammarus*), *Paramoera*, and *Corophium spinicorne*; in the subarctic-boreal region by *Pontoporeia affinis*; and on the Atlantic coast by the *Gammarus tigrinus* — *G. fasciatus* complex. The second subgroup includes the Holarctic *Rivulogammarus* complex (of which only *G. duebeni* is euryhaline) and the neotropical genus *Hyaella* which may have become ecologically separated from its marine-littoral relatives (*Hyaella*, *Allorchestes*) as early as the Mesozoic.

The relationship between body form and function in fresh-water amphipods would provide an interesting field of investigation and a possible guide to evolutionary relationships. For instance, the presence of sternal gills, the lengthening of peraeopod 4, and partial reduction of the pleopods in *Crangonyx* are to be expected in animals that have long frequented oxygen-deficient subterranean waters, that crawl about upright on or in the substratum, and are feeble swimmers. The pleopods, uropods, and telson of *Gammarus* are best developed in the lotic-water species, which are the more active swimmers, whereas the lentic-water forms, 'sidling' about on the substratum, have more pronounced dorsal abdominal spine groups and generally richer armature of the peraeopods. *Hyaella* swims rapidly with its powerfully developed pleopods; yet its peculiar mouthparts, brood plates, uropods, and telson, and ability to walk upright in air indicate a semiterrestrial ancestry.

North American fresh-water amphipods are essentially cold-stenothermal, both vegetatively and reproductively. The *Crangonyx* group, *Rivulogammarus*, *Anisogammarus*, *Paramoera* and *Pontoporeia*, live mainly in springs, streams, cave streams, lakes, and ponds that are cool to cold in summer, that breed in the winter and spring when water temperatures are low (5-15°C), and that normally produce only one brood per year. On the other hand, the American-Atlantic *Gammarus tigrinus* and *G. fasciatus*, the neotropical *Hyaella*, a very few of *Crangonyx*, and *Corophium spinicorne* breed in the late spring and summer, typically produce several broods per year, and are apparently limited northward by low summer water temperatures.

The preparation of this report has required the help of many scientific institutions and interested persons. For supplying material used in this study the writer is particularly grateful to officers of the Conservation Branch of the Ontario Department of Planning and Development, and the Royal Ontario Museum of Zoology and Palaeontology, Toronto, Ontario, and the Pacific Biological Station, Nanaimo, B.C. Valuable material and ecological information have been provided by Dr. D. S. Rawson and Mr. M. Atton, University of Saskatchewan; Dr. and Mrs. G. Clifford Carl, Victoria, B.C.; Dr. F. P. Ide, and Mr. J. B. Sprague, University of Toronto; Mr. Leslie Hubricht, Louisville, Ky.; Miss Catherine Boll, University of Missouri; Dr. J. S. Bleakney and Mr. W. Earl Godfrey, National Museum of Canada, Mr. H. Schultz, Canadian Wildlife Service, and Mr. Eric L. Mills, Ottawa; Mr. Pierre Brunel, Grande Riviere, Que.; Mr. H. J. Squires, St. John's, Nfld., and many others whose contributions appear in the station lists of material. Finally, the writer wishes to acknowledge the generous assistance with critical material and sources of

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KEY TO SPECIES (partly after Shoemaker, 1942)

1. Body dorso-ventrally depressed; coxal plates 1-4 very shallow, 4th not emarginate behind; gnathopod 2 simple; animal domicolous.....COROPHIIDAE
Segments of urosome separate; antenna 2, segment 4 alike in male and female
.....*Corophium spinicorne* Stimpson (p. 111)
Body laterally compressed; coxal plates deeper than wide, 4th excavate behind;
gnathopod 2 subchelate; nondomicolous..... 2
2. Antenna 1, accessory flagellum lacking; mandible without palp; maxilla 1, palp
vestigial, minutely two-jointed; uropod 3 uniramous or minutely biramous
.....TALITRIDAE
Telson entire; antenna 1 longer than peduncle of antenna 2; pleon segments 1 & 2
dorsally carinate; basos of pereopod 5 serrate posteriorly, that of 3 & 4
smooth.....*Hyalella azteca* (Saussure) (p. 109)
Antenna 1 with accessory flagellum (may be very minute or scalelike); mandible
with palp; maxilla 1 with normal two-jointed palp; uropod 3 typically biramous;
telson variously cleft or entire..... 3
3. Interantennal lobe of head acutely produced anteriorly; pereopods 3-5 unlike in
size and structure, 4th longest, basal joint of 5th greatly expanded; gnathopods
unlike, small, typically subchelate.....HAUSTORIIDAE
Antenna 1 not geniculate; uropod 3, outer ramus one-segmented; gnathopod 2
weakly subchelate; abdomen finely hirsute, not dorsally carinate.....
.....*Pontoporeia affinis* Lind. (p. 61)
Interantennal lobe broad, anterior margin perpendicular or slightly oblique;
pereopods 3-5 alike in structure but differing in length; gnathopods alike,
subchelate, second pair usually larger..... 4
4. Accessory flagellum more or less well-developed, at least two-jointed; inferior
antennal sinus (when present) broadly incised; uropod 3, rami usually not lance-
olate, inner ramus shorter; telson variously cleft or entire.....GAMMARIDAE 6
Accessory flagellum one-jointed, scalelike, or lacking; inferior antennal sinus sharply
incised; uropod 3, rami lanceolate, subequal; telson partly cleft.....
.....PONTOGENIIDAE
Gnathopods subchelate, segments 5 & 6 not markedly elongate or linear; accessory
flagellum one-jointed, blunt-conical.....*Paramoera* Miers 5
5. Gnathopods powerful and similar in both sexes; uropod 3 without lateral plumose
setae.....*P. carlottensis* n. sp. (p. 64)
Gnathopods moderate, unlike in male and female; uropod 3, rami with lateral
plumose setae, esp. on inner margin.....*P. columbiana* n. sp. (p. 62)
6. Antenna 1, accessory flagellum of 2-7 distinct segments; head with distinct inferior
antennal sinus; lower lip deep, inner lobes weak or lacking; maxilla 1, outer plate
normally with 11 apical pectinate spine teeth; pereopods 4 & 5 subequal;
urosomal segments dorsally spinose; without sternal gills; male typically larger
than female.....*Gammarus* section 7
Antenna 1, accessory flagellum of one distinct segment and one or more minute
terminal joints; head without inferior antennal sinus; lower lip broad, inner lobes
usually distinct; maxilla 1, outer plate typically with 7 apical pectinate spine
teeth; pereopod 4 longer than 5; urosomal segments dorsally smooth or nearly so;
sternal gills present; female typically the larger.....*Crangonyx* section 18
7. Gnathopod 1 larger than gnathopod 2 in male; palm slightly oblique and armed
throughout with numerous blunt peglike teeth; coxal gills with cylindrical
appendages (accessory gills); uropod 3, inner ramus very small; urosomal seg-
ment 4 not carinate dorsally.....*Anisogammarus* (*Eogammarus*) 8

- Gnathopod 1 smaller than gnathopod 2, palm usually very oblique, with one or two spine teeth at most; coxal gills without cylindrical appendages; uropod 3, inner ramus typically more than half the length of the outer. *Gammarus* (sens. lat.) 10
8. Antenna 1, peduncular segment 1 with 4-6 ventral (posterior) groups of setae; median dorsal abdominal spines short, 4 groups on abd. segment 5; uropod 3, terminal segment of outer ramus minute. *A. locustoides* (Brandt) (p. 86)
- Antenna 1, peduncular segment 1 with 1-2 ventral groups of setae; median dorsal abdominal spines moderately long, 2 groups on abd. segment 5; uropod 3, terminal segment of outer ramus conspicuous. 9
9. Median dorsal abdominal spines in groups of 3-4; dorsal posterior margin of abdominal segment 3 without setae or spines; male with calceoli. *A. confervicolus* (Stimps) (p. 86)
- Median dorsal abdominal spines singly inserted or paired; dorsal posterior margin of abdominal segment 3 with longish setae (occasionally also paired spines); male without calceoli on antenna 2. *A. ramellus* (Weckel) (p. 84)
10. Interantennal lobe of head with sharply defined upper angle and rounded, oblique anterior margin forming a shallow lateral sinus. *Gammarus* (*Gammarus*)
- Coxal plate 1 with 3-6 long antero-ventral setae; pereopods 4 & 5, hind lobe of basos small or lacking, when present armed with stout spines and setae; antenna 2 generally setose, flagellum without calceoli in the male. 11
- Interantennal lobe of head, anterior margin nearly perpendicular, upper and lower margins well defined, anterior angles usually rounded, lateral sinus deep; hind lobe of pereopods 4 & 5 free, without strong spines; male typically with calceoli on antenna 2. *Gammarus* (*Rivulogammarus*) 12
11. Antenna 1, ventral margin of peduncular segment 2 with one prominent group of setae and one or two small accessory setae; antennae 2 and pereopods in male without fine curled setae; urosome segments somewhat dorsally 'humped,' spine groups prominent. *G. fasciatus* Say (p. 69)
- Antenna 1, peduncular segment 2 with 2-4 equally strong median ventral groups of setae; antenna 2 and pereopods in male with numerous fine curled setae; urosome segments not 'humped,' spines relatively small. *G. tigrinus* Sexton (p. 66)
12. Peduncular segment 2 of antenna 1, ventral margin with 2-5 distinct groups of setae (in addition to terminal group); coxal plates 1 & 2, antero-ventral margins with 2-4 short setae. 13
- Peduncular segment 2, ventral margin with 1 (rarely 2) distinct groups of setae; coxal plates 1 & 2, antero-ventral margins with 1-2 short setae. 15
13. Antenna 2, flagellum without calceoli in male; ultimate segment of peduncle much longer than penultimate; uropod 3, inner ramus more than three-fourths the outer; eyes small, weakly pigmented. *G. acherondytes* H. & M. (p. 73)
- Antenna 2, flagellum normally with calceoli in the male; ultimate and penultimate segments of peduncle subequal; uropod 3, inner ramus less than three-fourths the outer; eyes large, reniform, deeply pigmented. 14
14. Peduncular segment 1 of antenna 1, ventral margin armed distally with 2-3 groups of setae; pereopod 4 & 5, segments 4 & 5 with groups of numerous long simple setae among spine clusters, anteriorly and posteriorly. *G. duebeni* Lillj. (p. 72)
- Peduncular segment 1, ventral margin distally with one group of setae; pereopods 4 & 5, segments 4 & 5 with few simple setae among spine clusters, anteriorly only. *G. minus* Say (p. 72)
15. Pereopod 5, basos narrow, posterior margin nearly straight, lined with a few short setae; uropod 3, outer ramus long and slender, tapering throughout, terminal segment with plumose setae on lateral margins; urosome segment 3 typically with one or both median dorsal spines lacking (replaced by fine setae). *G. lacustris* Sars 16
- Pereopod 5, basos expanded, posterior margin convex proximally, lined with numerous longish setae; uropod 3, outer ramus relatively broad, tapering near apex, terminal segment short, without lateral setae; median dorsal spines on urosome 3. 17

16. Lateral corners of abdominal side plates 2 & 3 acute, produced posteriorly, lower margin armed with groups of longish setae; eyes subreniform, deeper than broad; dorsal abdominal spines totaling 14-24 *G. l. limmaeus* Smith (p. 81)
- Lateral corners of abdominal side plates 2 & 3 weakly acute, not produced posteriorly, lower margin with singly inserted setae and a few short spines; eyes subrotund, separated from anterior margin of head by nearly their width; dorsal abdominal spines totaling 10-14 *G. l. lacustris* Sars (p. 80)
17. Eye small to median, subovate; antennae long and slender, rather setose; peraeopods 4 & 5, inner face of basos with a few setae, segments 4-6 with numerous long setae among spine clusters *G. troglophilus* H. & M. (p. 78)
- Eyes medium large, reniform; antennae normal in length and setation; peraeopods 4 & 5, inner face of basos with many setae singly or in groups; segments 4-6 with only a few short setae among spine clusters *G. pseudolimnaeus* n. sp. (p. 74)
18. Eyes normally present and pigmented; if absent or unpigmented, uropod 3 biramous and telson cleft (both sexes); antenna 2 armed with calceoli in male 19
- Eyes absent; antenna 2 in male without calceoli; other characters not combined obligate-subterranean genera*
19. Uropod 3 uniramous, ramus not longer than peduncle; urosome coalesced *Synurella*†
- Uropod 3 unequally biramous, outer ramus longer than peduncle; urosome segments free *Crangonyx* (sens. lat.) 20
20. Eyes normally developed, darkly pigmented epigeic species 21
- Eyes reduced to a few pigmented facets or absent subterranean species†
21. Propodus of gnathopod 2, palmar margin very oblique, posterior margin less than half the anterior margin; outer margin of dactyl with three or more sensory setae 22
- Propodus of gnathopod 2, palmar margin not unusually oblique, posterior margin half or more than half the length of the anterior margin; outer margin of dactyl armed with one, sometimes two median sensory setae 23
22. Propodus of gnathopod 2, superior lateral setae singly inserted; basal segments of peraeopods 3-5 deeply serrated posteriorly; telson much longer than broad, deeply cleft *C. serratus* (Embody) (p. 90)
- Superior lateral setae inserted in groups of two or more; basal segments of peraeopods 3-5 not deeply serrated; telson short, shallowly cleft *C. obliquus* (H. & M. (p. 89)
23. Propodus of gnathopod 2, superior lateral setae in transverse groups of three or more 24
- Superior lateral setae singly or occasionally doubly inserted 26
24. Uropod 3, outer ramus slender, length about four times the width; abd. side plate 2, lateral corner strongly produced posteriorly; maxilla 2, facial row of setae of inner plate nearly obsolete *C. richmondensis* Ellis
- (*C. r. richmondensis* Ellis—p. 90) (*C. r. laurentianus* n. subsp.—p. 94; *C. r. occidentalis* H. & H.—p. 91).
- Uropod 3, outer ramus stout, length less than three times the width; abd. side plate 2, lateral corner acute but not strongly produced; maxilla 2, facial row of setae of inner plate well developed 25
25. Telson cleft about half way to base, each lobe with 5-6 apical spines; basos of peraeopods 3-5 considerably expanded, posterior border with numerous minute serrations; males larger than females *C. anomalus* Hubricht (p. 87)
- Telson shallowly cleft, each lobe with 3-4 apical spines; basos of peraeopods 3-5 not unusually expanded, serrations normal; males smaller *C. forbesi* (H. & M.) (p. 87)

*About 25 known continental N. American species, in six somewhat overlapping genera, including *Allocrangonyx* Schellenberg, *Apocrangonyx* Stebbing, *Bactrurus* W. P. Hay, *Stygobromus* Cope, *Stygonectes* W. P. Hay, and *Synpleonia* Creaser. (Keys and descriptions in Shoemaker, 1942, and Hubricht, 1943).

†Essentially Eurasian (see Carausu, *et al.*, 1955) but represented in N. America by *S. johanseni* Shoemaker 1920 (Alaska); *S. bifurca* (O. P. Hay) 1882 (Tenn., Ala., Miss., La., Ark., Mo.); *S. chamberlaini* (Ellis) 1940 (S. C.); and *S. dentata* Hubricht 1943 (Ky.).

‡Include *C. antennatus* Packard 1881 (Tenn.); *C. packardii* Smith 1888 (Ind., Ky., Kan., Ark.); *C. dearolfi* Shoemaker 1942 (Pa.); and *C. hobbsi* Shoemaker 1941 (Fla.).

26. Palmar margin of propod (seg. 6) of gnathopods, in female, straight or concave and armed throughout with heavy notched spine teeth; inner margin of corresponding dactyl armed with several teeth; uropod 3 short, outer ramus 1-1½ times the peduncle; length 7-18 mm 27
- Palmar margin of propod convex and armed with weak, minutely notched spine teeth, heavier at posterior angle; inner margin of dactyl armed with a few setae but no teeth; uropod 3, outer ramus usually more than 1½ times the peduncle; length 3.5-11 mm 29
27. Uropod 2 in the male, outer ramus with comb spines *C. shoemakeri* (H. & M.) (p. 95)
- Uropod 2 in the male, outer ramus without comb spines 28
28. Abdominal side plates 1 & 3 nearly quadrate, lateral corners acute; some or all of pereopods 1-5 with 2-3 prominent setae on inner margin of dactyl *C. setodactylus* n. sp. (p. 96)
- Abdominal side plates 1 & 3, lateral corners recessed, not acutely pointed; pereopods with only one prominent seta on inner margin of dactyl *C. minor* n. sp. (p. 98)
29. Abdominal side plates 1 & 3, lateral corners acute, that of 2 strongly produced posteriorly; basos of pereopod 5 conspicuously serrated posteriorly; setae of posterior margin of propodus of gnathopod 1 singly inserted 30
- Lateral corners of side plates 1 & 3 nearly quadrate, of 2 acute but not produced posteriorly; basos of pereopod 5 weakly serrated; posterior marginal setae of propodus of gnathopod 1 distally in groups of 2-4 *C. rivularis* n. sp. (p. 100)
30. Antenna 2, posterior margin of peduncular segment 4 armed with 3-4 groups of long setae; gnathopod 2 in female, outer row of spines at posterior angle of propodus consists of one long and two shorter accessory spines; uropod 2 in the male, outer ramus with comb spines *C. pseudogracilis* n. sp. (p. 102)
- Antenna 2, posterior margin of peduncular segment 4 with only one group of long setae; propodus of gnathopod 2 in female, outer row of spines at posterior angle consists of one long and one (or none) short accessory spines; uropod 2 in male without comb spines on outer ramus *C. gracilis* Smith (p. 105)

Family HAUSTORIIDAE

Pontoporeia affinis Lindstrom

Pontoporeia affinis Lindstrom 1855, p. 63; S. I. Smith 1871, p. 452; Shoemaker 1920, p. 10E; Segerstrale, 1937; Shoemaker 1942, p. 3; Larkin 1948, p. 5.

Pontoporeia hoyi Smith 1874, p. 647, pl. II, fig. 5.

Pontoporeia filicornis Smith 1874, p. 649; Adamstone 1928, p. 366; Sheffer and Robinson 1939, p. 120.

Pontoporeia kendalli Norton 1909, p. 247, fig. 1.

Pontoporeia affinis var. *brevicornis* Segerstrale 1950, p. 13, fig. 9; Henson, 1954.

Distribution and Ecology: Large deep lakes and rivers of Canada and the United States, from the shores of the Arctic Ocean south to the limits of Pleistocene glaciation, from Labrador and central Maine on the east to Lake Washington on the west. In summer it occurs even in the shallows of northern lakes but only in deep cold parts of southern lakes where temperatures do not exceed 14.5°C. Pelagic males in October; ovigerous females from November to April; life span of slightly more than two years.

Material Examined: ALBERTA: Waterton L., sev. specimens. SASK.: D. S. Rawson collections, 1943-1956 - Reindeer L., L. La Ronge, Wollaston L., L. Athabaska. ONTARIO: L. Erie, 2 miles off Pottahawk Pt., 30-40 ft, E.L.B., Aug. 29, 1956, 24 subadult spec., NMC No. 2115; L. Nipigon, Orient and McIntyre Bays, F. B. Adamstone, summer, 1921, 1923, several hundred specimens.

Remarks: On the basis of morphological and ecological similarities the writer would concur with Segerstrale and others that North American material

is not specifically distinct from the European *Pontoporeia affinis* Lindstrom. Minor but apparently consistent morphological differences between representative fresh-water material of the two continents have been noted by Smith, Segerstrale, and others, to which the specific or varietal names *hoyi*, *kendalli*, *flicornis*, *brevicornis*, and *typica* have been variously applied. Evidence to date could be interpreted to provide grounds for subspecific recognition of all North American material (as *p. a. hoyi* Smith) and that within this complex are one or more varieties of relatively recent evolution. The rather large, morphologically and ecologically distinct form recorded under the name *Pontoporeia affinis* from littoral salt waters of Ungava Bay (Dunbar, 1954) and the St. Lawrence estuary (Bousfield, 1955a) may prove specifically separable from Lindstrom's form. However, until more extensive information on the taxonomy, distributional ecology, and physiology of the entire North American and European species complex becomes available it seems advisable to refer all North American fresh-water material simply to *Pontoporeia affinis* Lindstrom.

Family PONTOGENIIDAE

Paramoera columbiana n. sp.

Paramoera mohri, Bousfield (1958), p. 110, 112.

Distribution and Ecology: Spray pools, and tidal portions of coastal fresh-water streams of British Columbia; from Prince Rupert and the Queen Charlotte Islands south to Vancouver and Nanaimo. Breeds in late winter and spring; life cycle probably of one year only.

Material Examined: QUEEN CHARLOTTE ISLANDS: author coll., 1957: Spray pools at north end of Gray Bay, Moresby I., E.L.B., July 12, 1957—Female, type; male, allotype; 19 males and 4 females (ovig.), paratypes. NMC Nos. 2276 & 2277. Stream mouths near Skidegate Mission, W. of Queen Charlotte City, Graham I.; N. Side of Copper Bay; and E. of Cape Fanny, Moresby I.; W. coast Graham I. at Mountain Creek, Shield's Bay; S. of Stiu Pt.; N. side Gudal Bay; and S. side Gudal Bay. PRINCE RUPERT: mouth of Hay's Creek, E. L. B., July 3, 1957—1 male, 1 female, (ovig.) 39 imm. SOUTHERN B.C.; author coll., 1955: mouth of Berkeley stream, Departure Bay; Emmond's Beach, N. of Powell River; and Deep Cove, Indian Arm, near Vancouver.

Diagnosis (Figures 1, 2): Female (7.5 mm) — Interantennal lobe rather large, smoothly rounded; inferior antennal sinus sharply incised. Eyes large, black, subquadrate, nearly meeting middorsally. Antenna 1 a little longer than antenna 2; peduncular segments 1, 2, & 3 with 3, 2, and 1 groups of ventral setae respectively; flagellum of 20-25 segments, alternate segments with clavate sense organs posteriorly. Accessory flagellum conical, about 1/3 the first flagellar segment. Antenna 2, peduncular segment 5 not longer than 4, armed posteriorly with 2-3 groups of long setae; flagellum 12-17 segmented, without clavate sense organs.

ABBREVIATIONS FOR FIGURES

Ant	Antenna	Hd	Head region	Plp.	Palp
Brpl	Brood-plate	Lft	Left	Plp 1	Pleopod 1
Brpl set.	Brood-plate setae	L. L.	Lower Lip	Rt	Right
Cx	Coxal plate	Md	Mandible	T	Telson
Clc	Calceolus	Mx	Maxilla	U	Uropod
Ep	Epimeral plate(s)	Mxpd	Maxilliped	U. L.	Upper Lip
Gn	Gnathopod	P	Peraeopod	Uros	Urosome

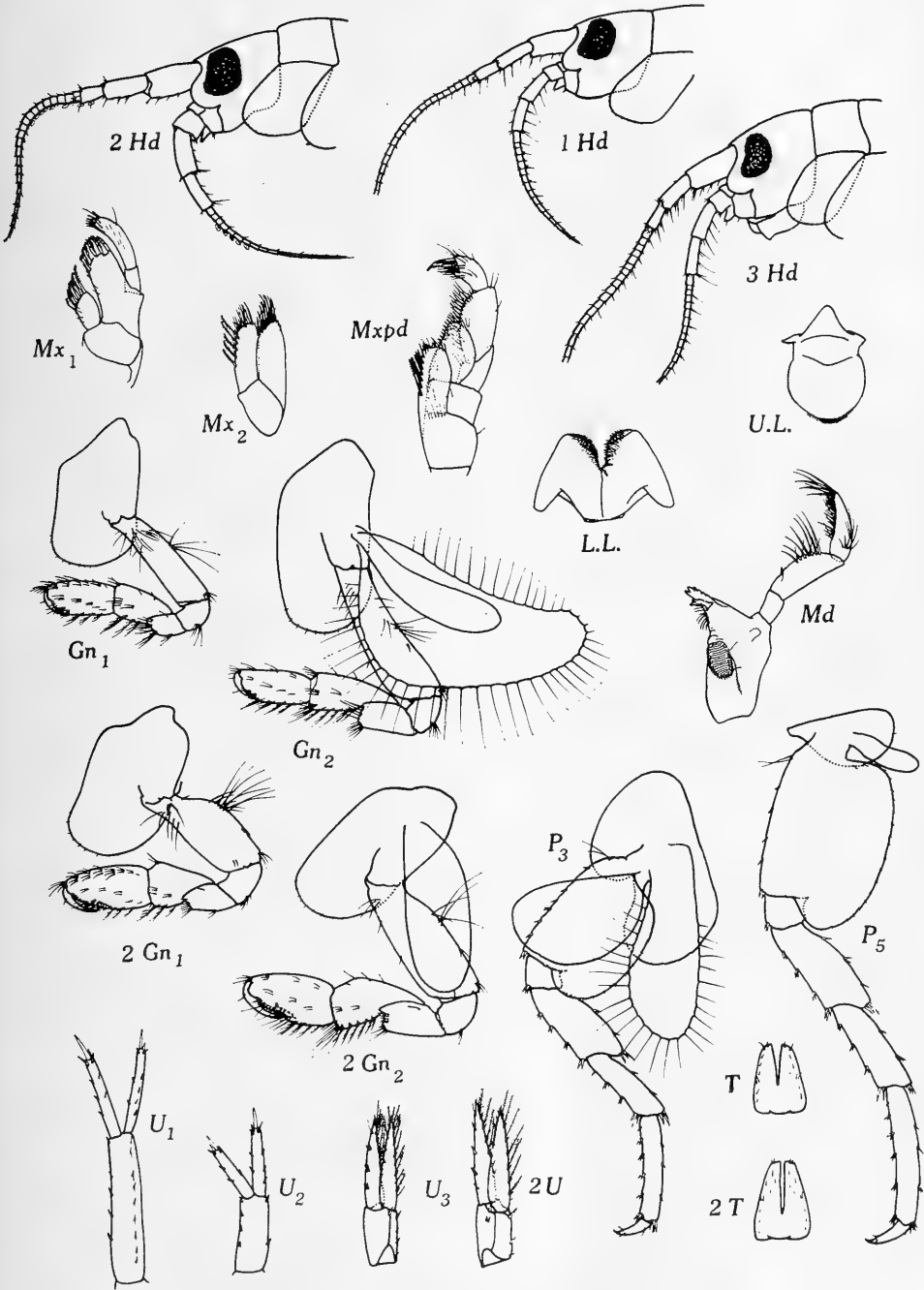


Figure 1. *Paramoera columbiana* n. sp. Gray Bay, Moeresby I., B.C. 1. Female, 7.5 mm (TYPE). 2. Male, 8.0 (ALLOTYPE). 3. Imm. Female, 7.0 mm (PARATYPE).

Mandibular palp, segment 2 slightly broadened medially; subequal segment 3, most of inner margin lined with stout setae. Lower lip, inner lobes vestigial. Maxilla 1, inner plate with 6 marginal plumose setae; outer plate with 11 conspicuously pectinate spine teeth; right palp with 6-8 apical spine teeth and a few setae, left palp with 5-6 spines and 3-4 setae. Maxilla 2, inner plate with row of 5 large plumose setae diverging distally from inner margin. Maxilliped, inner plate with 3 apical spine teeth and 7-8 marginal plumose setae.

Gnathopod 1, segment 6 (propod) subrectangular, longer than segment 5, with 6-7 groups of superior-lateral, 4-5 of inferior-lateral, and 3-4 of posterior setae; palmar margin convex, oblique, posterior angle defined by 3 prominent spines and 2 groups of spines on inner face. Dactyl close fitting, weakly toothed along inner margin. Gnathopod 2 similar but longer; segment 6 shorter than segment 5, with 3-4 groups of superior-lateral, and inferior lateral setae, and 5 groups along posterior margin.

Peraeopod 2 shorter than 1, coxal plate shallow-excavate behind. Peraeopods 3-5 increasing successively in length; segment 2 (basos) in all moderately expanded, posterior margin evenly convex, serrulate. Coxal gills on peraeon segments 2-7, posterior smallest. Broad lamellae on peraeon segments 2-5, hindmost smallest.

Pleopods powerful, 3rd shortest; rami subequal, about 16-segmented (basally fused), peduncle with 2 coupling spines. Abdominal side plates 2 & 3, posterior margin serrulate, that of 3 convex. Uropod 1, subequal rami about 2/3 the peduncle. Uropod 2, outer ramus shorter than inner, both shorter than peduncle. Uropod 3, rami subequal, lanceolate, 1½ times the peduncle, inner margins lined with singly inserted plumose setae. Telson cleft two-thirds to the base, each lobe with apical spine and seta, and several fine setae dorsally along outer margin.

In the immature male and female, the eyes are broad reniform in shape and smaller in size. The ventral peduncular setae of the antennae are longer and better developed. Male (8 mm): Eyes very large and subquadrate. Antenna 1 with platelike calceoli on peduncular segment 3 and proximal 6-8 antennal segments; accessory flagellum nearly 2/3 the first antennal segment. Antenna 2 with calceoli on proximal 7 flagellar segments. Peduncular segments stouter than in female; ventral marginal setae short.

Gnathopods stouter, more powerfully subchelate. Gnathopod 1, segment 6 subovate, palmar margin very oblique; tip of dactyl closing between two rows of conical spines at the posterior angle. Gnathopod 2 similar, but segment 6 shorter than 5, and its long axis dorsally reflected. Peraeopods 3-5 proportionately a little longer than in the female.

Remarks: *Paramoera columbiana* belongs in the group of *P. mohri* Barnard (1952), *P. koreana* Stephensen (1944) and *P. fasciculata* (Thomson) lacking sternal gills and having gnathopods weakly subchelate and sublinear (in female), inner margin of dactyl inconspicuously dentate. Habitat characteristically marine intertidal. The species differs from *koreana* in having coxal gills on peraeopod 7, and from *P. mohri* (its closest relative) in the larger eye, more numerous palmar spines on segment 6 of the gnathopods, the minutely serrulate posterior borders of Ep 2 & 3, the richer dorsal armature of the telson, and its occurrence in fresh water.

***Paramoera carlottensis* n. sp.**

Distribution and Ecology: Recorded from fresh-water spray pools on the west coast of the Queen Charlotte Islands, B.C., in company with *P. columbiana*, *Anisogammarus confervicolus*, mayfly nymphs, and tadpoles of *Bufo boreus*. Breeding season probably in winter and early spring.

Material Examined: Rocky shore south of Stiu Pt., Cartwright Sd., west coast of Graham I., B.C.; fresh-water pools above normal high water level, E. L. B., July 26, 1957 — Female, type; male, allotype; 7 males, 5 females, paratypes. NMC. Nos. 2278, 2279. Spray pools at stream mouth, S. side Gudal Bay, Graham I., July 27, 1957 — 1 male.

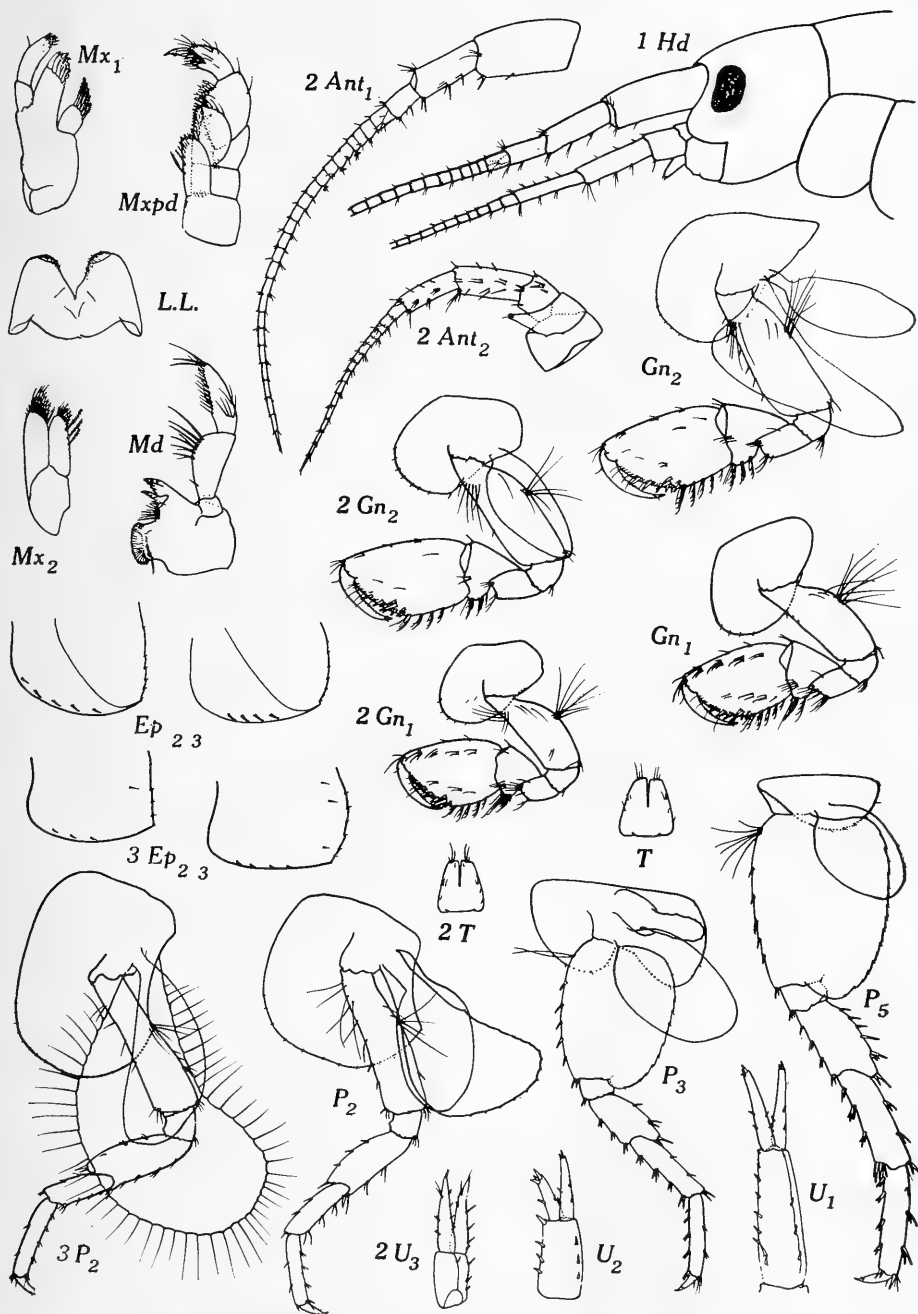


Figure 2. *Paramoera carlottensis* n. sp. Stiu Pt., West coast Graham I., B.C. 1. Female, 8.0 mm (TYPE). 2. Male, 7.0 mm (ALLOTYPE).
Paramoera columbiana n. sp. 3. Female, 7.5 mm (TYPE).

Diagnosis (Figure 2): Female, subadult (8.0 mm) — Interantennal lobe broadly rounded, inferior antennal sinus sharply incised. Eyes medium-small, broad-reniform, black. Antenna 1, peduncular segments 1-3 successively shorter, with 2, 2, and 1 groups of setae respectively; flagellum of 24-28 segments, alternately bearing long-clavate sense organs; accessory flagellum conical, about $\frac{1}{2}$ the first flagellar segment. Antenna 2 much shorter; peduncular segment 5 shorter than 4, ventral setae short and sparse; flagellum of about 12 segments, without clavate sense organs.

Mandibular palp, segment 2 broadened medially. Lower lip without inner lobes. Maxilla 1, inner plate with 5 plumose setae; outer plate with 11 strongly pectinate spine teeth; left palp with 5 apical spines and a few setae. Maxilla 2, inner plate with 3-4 long plumose setae diverging distally from inner margin. Maxilliped, inner lobe with 3 apical spine teeth and 6-7 marginal plumose setae; outer plate broad.

Gnathopods powerfully subchelate. Gnathopod 1, segment 6 longer than broad, with about 4 groups each of superior-lateral and inferior-lateral setae; palmar margin convex, oblique, lined with 4 or 5 stout spines and numerous stiff setae; dactyl toothed along inner margin, closely fitting palm, tip closing among group of spines at posterior angle. Gnathopod 2 similar; segment 6 relatively longer than broad, almost devoid of lateral setae.

Peraeopod 2 shorter than 1, coxal plate broader than deep, shallowly excavate behind. Peraeopods 3-5 successively longer; basos moderately expanded, posterior margin serrulate. Coxal gills on segments 2-7, decreasing in size posteriorly. Brood lamellae large on segments 2-4, very small on 5 (marginal setae not developed in material examined).

Pleopods strongly natatory; rami subequal, longer than peduncle, 10-12 segmented; peduncle with 2 coupling spines distally on inner margin. Abdominal side plates 2 & 3, hind margins convex, serrulate. Uropod 1, subequal rami about half the peduncle. Uropod 2 shorter than peduncle of uropod 1, outer ramus about three-fourths the inner. Uropod 3 equal in length to uropod 2; rami lanceolate, subequal, margins lined with groups of short spines and distally a few setae, none plumose. Telson cleft two-thirds to the base, lobes with longish apical setae and fine dorsolateral setae.

Male, subadult (7.0 mm): Antenna 1 with platelike calceoli or proximal 5-6 flagellar segments. Antenna 2 with calceoli on proximal 7-8 flagellar segments. Gnathopods similar to those of female but relatively stouter and more powerful.

Remarks: *Paramoera carlottensis* is closest to the group of *P. japonica* Tattersall (1922), *P. yezoensis* Ueno (1933), and *P. hayamaensis* Stephensen (1944) typically with sternal gills and having gnathopods powerfully subchelate, similar, and alike in both sexes, dactyls conspicuously dentate on inner margin; habitat in fresh-water streams (of Japan). The present species differs from all three, however, in lacking sternal gills except for a median sternal process in peraeon segment 2; also, the gnathopods are more powerful, the accessory flagellum larger, and rami of uropod 3 have fewer lateral setae.

Family GAMMARIDAE

Gammarus Section

Gammarus (*Gammarus*) *tigrinus* Sexton

? *Gammarus fasciatus* Say, 1818, p. 375 (salt-water form); Smith, 1874, p. 654 (Eastport, Me.); Hubricht, 1943, p. 6 (*partim*).

Gammarus fasciatus Johansen, 1922, p. 180 (Charlottetown, P.E.I.); Hynes, 1954 b, 1955; Bousfield, 1955a, b, 1956a, b.

Gammarus tigrinus Sexton, 1939, p. 543, figs. 1-27.

Distribution and Ecology: Low brackish and tidal fresh waters of estuaries and river mouths of the American Atlantic coast from the St. Lawrence estuary (Baie Comeau) south to Florida (excl. Newfoundland); probably recently introduced in the British Isles. Inhabits shores and shallows of turbid tidal

fresh waters that are relatively warm in summer. Oviparous females from May to September; life cycle of 8 months to one year.

Material Examined: Author collections 1950-1956 from: Que.: St. Lawrence estuary — Montmagny, Richer R. mouth, St. Tite des Caps, Grand Etang, Gaspé. N.B.: mouth of Caraquet R., tidal f. water of the Miramichi estuary. P.E.I.: West Souris, Long Pond (nr. Grand Tracadie). N.S.: Pugwash R. mouth; South Sonora, mouth of St. Mary's R.; mouth of stream, Hampton, Annapolis Co.; East R. mouth, Lunenburg Co.; mouth of Ohio R., Shag Harbour, Shelburne Co.; Pig Yoke R. mouth, E. Pubnico, Yarmouth Co.; also collections of Atlantic Biol. Sta., from the Shubenacadie estuary. MAINE: Sheepscot R. mouth, Lincoln Co., A. P. Stickney, June 13, 1956, one male. MD.: Head of Chesapeake Bay (many localities), collections of the U.S. National Museum. N.C.: N. River Road, ditch; Cape Fear R., 12 miles above sea; Newport R., above narrows. S.C.: Edisto R., Willtown Bluff (several lots). GEORGIA: Ogeechee R., King's Ferry. FLORIDA: St. John's R., Welaka.

Diagnosis (Figure 3): Very similar to *Gammarus fasciatus* in coloration and body structure; distinguished chiefly by characters given in the key to species (p. 59) and by the less acutely produced lateral corners of the abdominal side plates, and the slightly larger size at maturity. The species has been carefully described and figured by Sexton (1939), except for the mouthparts and a few other points of comparison which are herewith noted:

Male (11-14.5 mm): Interantennal lobe rather acutely angled above, rounded below. Antenna 1 shorter than antenna 2; peduncular segments 1, 2, and 3 with 1-2, 2-4, and 1-2 median ventral groups of setae respectively. Antenna 2, peduncular segment 5 a little longer than 4, both clothed anteriorly and laterally with numerous groups of setae, and posteriorly with clusters of long setae, many of which are curled at the tips; flagellum heavily setose.

Mouthparts much as in *G. fasciatus*. Lower lip, inner lobes obsolete. Mandibular palp with up to 10 long setae distally on inner margin of segment 2. Maxilla 1, inner plate with about 12 marginal plumose setae; outer plate relatively short and broad, palp of right side broad, with 3-4 stout conical spine teeth and a few setae at the apex; that of left side with about 10 stiff setae, no setae on outer margin. Maxilla 2, inner face of inner plate with 8-9 long setae in a row diverging distally from inner margin. Maxilliped, inner plate with about six short plumose setae on inner margin.

Remarks: The writer has compared material from Frodsham, England, and Loch Neagh, Ireland, (kindly supplied by Dr. H. B. N. Hynes) with that from American Atlantic localities (above) and was unable to find consistent differences between them. The plumosity of the long setae on the margins of segment 2 of gnathopods and pereopods 1 & 2 is extremely fine, visible only at high magnifications. Pereopods 4 & 5 are almost exactly equal in length in both sexes. The lateral corners of abdominal side plates 2 & 3 are nearly quadrate, less pronounced posteriorly than in Sexton's figured specimen, and much less so than in *G. fasciatus*. Uropod 3, rami proportionately a little longer and more slender than in *G. fasciatus*; inner ramus nearly equal to the basal segment of the outer (Sexton's type, in this respect, is atypical of the species); terminal segment of outer ramus relatively short, not bearing plumose lateral setae in the type and only very exceptionally in material examined.

G. tigrinus was for more than a century unrecognized as a distinct species on the American Atlantic coast (to which it is native) because of its close morphological similarity and high degree of ecological and geographical overlap with *Gammarus fasciatus*. In the British Isles the brackish water *tigrinus* is conspicuously unlike all other native species and thus soon attracted the attention of Dr. Sexton to whom we owe its specific recognition. The subsequent confusion of the two species by Hynes (1954 and following) and the writer

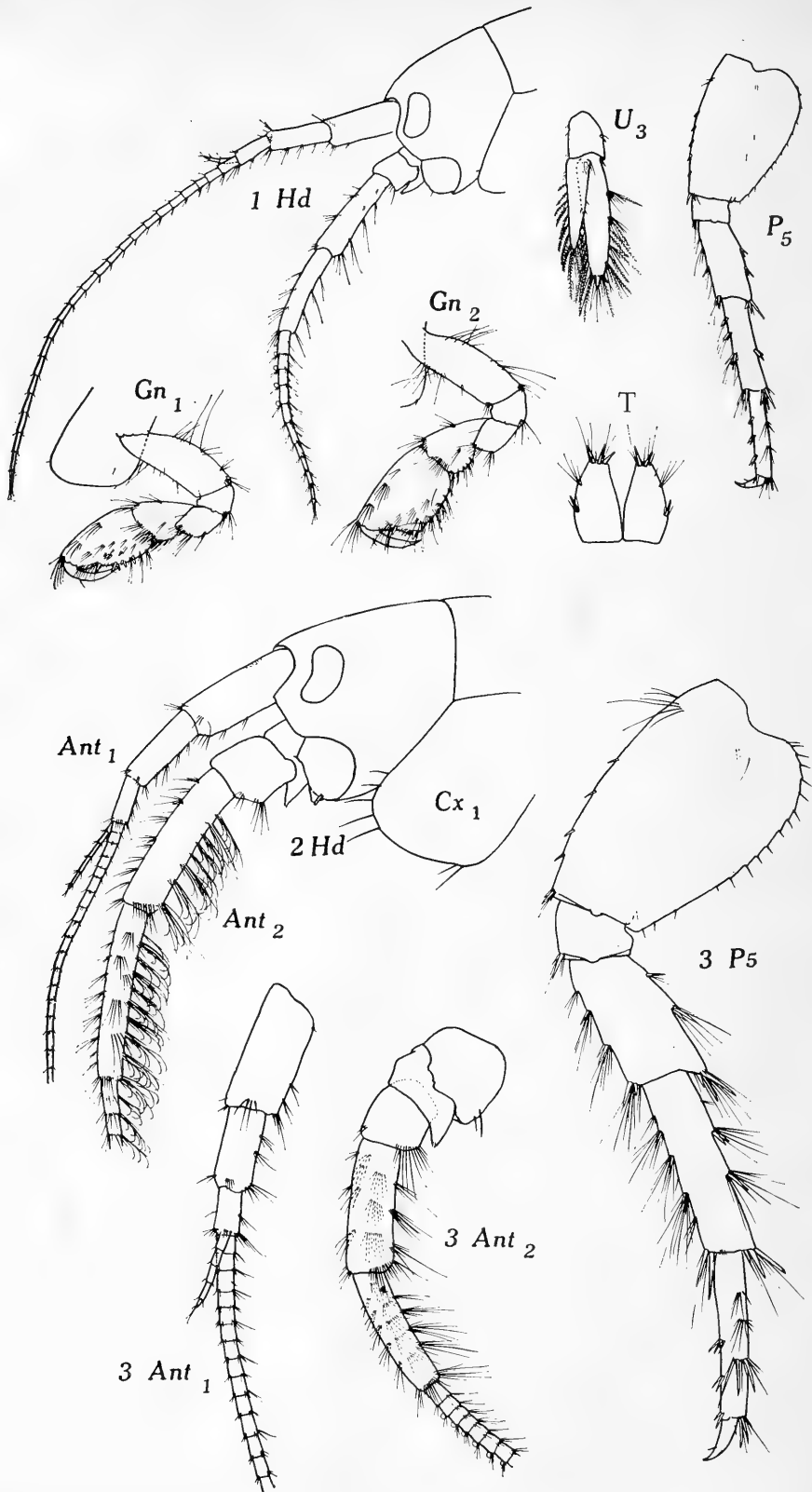


Figure 3. *Gammarus minus* Say. Monterey, Virginia. 1. Male, 8.5 mm.
Gammarus tigrinus Sexton. St. Majorique, Gaspé Bay, Que. 2. Male, 12.5 mm.
Gammarus duebeni Lillj. Western Head, Queens Co., N.S. 3. Male, 17 mm.

(1955, 1956) was based on comparison of material from the British Isles with that from estuaries on the Canadian Atlantic coast (head of Gaspe Bay and Hampton, N.S.) which had previously been identified by Dr. Shoemaker and Dr. Segerstrale as *G. fasciatus* but which in fact was the brackish-water *G. tigrinus*. Recently Dr. Henry O. Werntz, Woods Hole Oceanographic Institution, has been chiefly responsible for defining the distinctive morphological characters of the two species and working out their different physiological and ecological tolerances.

Gammarus (Gammarus) fasciatus Say

Gammarus fasciatus Say, 1818, p. 374 (*partim*); S. I. Smith, 1874, p. 653 (*partim*); Weckel, 1907, (*partim*); p. 48, non fig.; Huntsman, 1915, p. 151, fig. 4b. Pentland, 1930 (*partim*); Hubricht and Mackin, 1940, (*partim*) p. 193, fig. 3; Hubricht, 1943 (*partim*), p. 6; Clemens, 1950.
Gammarus sp., Nicholson, 1872, p. 500.

Distribution and Ecology: Lakes and large rivers that are slow-flowing, relatively turbid, and warm in summer; from the shoreline to about 40 feet in depth; authentically known from the Chesapeake, Delaware, Hudson, and St. Lawrence drainage systems including the Great Lakes; probably also in the Mississippi system. Ovigerous females from May to September; two generations per year; life cycle of less than one year's duration.

Material Examined: Author collections from: ONTARIO: L. Huron, near mouth of Thessalon R.; L. Erie, off Pottahawk Pt.; Long Pt., Head of Rondeau Bay, J. R. Dymond, June 13, 1941; L. Ontario: Toronto Islands; Miner Bay; Moore Park, A. G. Huntsman, April, 1913; St. Lawrence R., Sheek I., Long Sault Rapids, J. S. Bleakney, April, 1957; Ont. Dept. Planning and Development collections (1946-1955) in the lower regions of the following rivers: South Nation, Napanee, Don, Grand, Lynn, Big and Otter. QUEBEC: St. Lawrence R., Montreal to the head of salt water at Neuville, Bordeaux, Richelieu, Montmorency, St. Eustache, Roxboro, Plage St. Michel, St. Vallier, Montmagny, Richer R., Orleans I. VERMONT: L. Champlain, Burlington. NEW YORK: Niagara R., above falls; Cayuga L., Seneca Falls; Hudson R., opposite Germantown; N. of Saugerties Light; Hallenbeck Creek. PENNSYLVANIA: Susquehanna R., at Paquea. NEW JERSEY: North of Riverton, Delaware R., Creskill. MARYLAND: Potomac R., near Georgetown; Port Tobacco, Charles Co. DELAWARE: Delaware City. WISCONSIN: mouth of Fish Creek slough, L. Superior, Ashland.

Diagnosis (Figure 4): A strikingly banded, setiferous species having antenna 1 shorter than antenna 2, eyes large and reniform and dorsal abdominal spines in prominent groups.

Male (13 mm): Interantennal lobe of head with oblique anterior margin, upper angle sharp, lower rounded, lateral sinus moderate. Eye large, black, broad-reniform. Antenna 1 typically shorter than antenna 2, peduncle much shorter than flagellum; segment 2 of peduncle with 1-3 median ventral groups of setae, the middle group the most prominent and present even in females and immatures; segment 3 very short, with one median ventral group of setae; flagellum 25-30 segmented, with minute paddleshaped sensory organs borne antero-distally on each segment, much as in *G. tigrinus* (Sexton, 1939, fig. 2); accessory flagellum 5-6 jointed. Antenna 2, peduncle much longer than the 13-segmented flagellum; peduncular segment 4 longer than 5, margins with numerous groups of setae, none of which have curled tips. Upper lip distally rounded, minutely setose. Lower lip, inner lobes not distinctly marked off. Mandibular palp rather long and slender; segment 2 distally with 6-7 longish setae; inner margin of terminal segment distally convex. Maxilla 1, inner lobe (not shown in Figure 2) small, with 12-14 marginal setae; right palp with 5-6 short apical spine teeth and left palp with several stout setae distally and one seta on outer margin. Maxilla 2, inner plate with facial row of 10 setae. Maxilliped, inner plate about twice as

wide as long, median distal angle sharp, apex with 3 spine teeth, inner margin with about 7 plumose setae, outer plate, outer margin with numerous short curved spines; segment 2 of palp much the longest; segment 3 with three groups of setae on outer margin.

Coxal plates 1 & 2 with about 5 rather long setae at antero-ventral angle and about 3 shorter postero-ventral setae. Gnathopod 1, segment 2 stout; segment 5, posterior margin with 4 groups of setae, some being pectinate; segment 6 (propodus) large, subovate, palmar margin slightly concave, very oblique, with stout median spine and cluster of long setae; posterior angle with several stout spines against which closes the tip of the strongly curved dactyl; posterior margin gently convex, bearing 4-5 groups of setae; inner face of propodus with 1-3 superior lateral and 4-5 inferior lateral groups of setae. Gnathopod 2 somewhat similar but larger; segment 2 with longer and more extensive marginal setae; segment 5 with 6-7 posterior groups of setae; propodus subrectangular, palmar margin slightly concave, oblique, bearing two stout spines; 3 small groups of superior lateral and 4-6 groups of inferior lateral setae. Peraeopod 1 a little longer than 2, posterior margins of segments 4-6 (in both) armed with five or more clusters of very long simple setae. Peraeopods 3-5 relatively short and stout, segments 4-6 with groups of spines and clusters of long setae (none with curled tips); segments 5 & 6 subequal; dactyls rather short and strongly curved; peraeopod 3, posterior margin of basos concave, lined with short setae, hind lobe free, rounded; peraeopods 4 & 5, basos longer but narrowing distally to sharply angled corner bearing a few spines and long setae; posterior margin with numerous rather long setae, slightly concave distally; inner face with numerous setae. Coxal gills on segments 2-7, smallest posteriorly.

Pleopods 1 & 2 subequal, 3rd shortest; plumose rami subequal, nearly twice the peduncle, about 20-segmented (basally fused); three or four basal setae of inner ramus are stout, cleft distally, tips barbed or weakly pectinate. Coupling spines 3-4, of which 2 are hooked. Abdominal side plates 2 & 3, ventral margins with numerous long setae; posterior margins slightly oblique, bearing a few short setae, lateral corners acutely produced.

Uropod 1, rami subequal, about two-thirds the peduncle. Uropod 2, outer ramus shorter than inner. Uropod 3, rami long, slightly curved and sharply tapering distally; inner ramus a little shorter than basal segment of outer ramus; in mature specimens one or two setae are singly inserted on lateral margins of the well-developed terminal segment of the outer ramus. Urosome segments moderately 'humped' middorsally as in certain marine species (*G. oceanicus*, etc.); median and lateral spines strong, 2-3 per group. Telson cleft to base, each lobe with one dorso-lateral and two or three terminal spines.

Female (8-12 mm): Compared to the male, antenna 1 is relatively longer and A2 much less hairy. Gnathopods 1 & 2 similar, but much smaller and weaker; palmar margin of propod less oblique, without stout median spines. Peraeopods shorter and less setose, Uropod 3, rami shorter and broader, margins less setose. Brood plates on segments 2-5, the last quite small.

Remarks: Say's original description and notes on the ecology and behaviour of this species are remarkably detailed, particularly concerning the banded coloration of the body segments and appendages in life. He noted, but did not consider specifically distinct, a closely similar "inhabitant of the salt water" which may have been what is now known as *G. tigrinus* Sexton. However, Say's description leaves no doubt that the name *fasciatus* must be applied to the fresh-water animal, if only because it is mentioned first in the description. Unfortunately, Say did not describe many of the presently accepted diagnostic characters of the appendages, a circumstance which may have contributed to the confusion of this species with the superficially similar *G. pseudolimnaeus* (Weckel, 1907; Huntsman, 1915; Pentland, 1930) and *G. tigrinus* (Hubricht & Mackin, 1940; Hubricht, 1943). Clemens (1950, p. 5) has summarized distributional records referred by 14 previous authors to the name "*Gammarus fasciatus*," records which actually comprise at least three

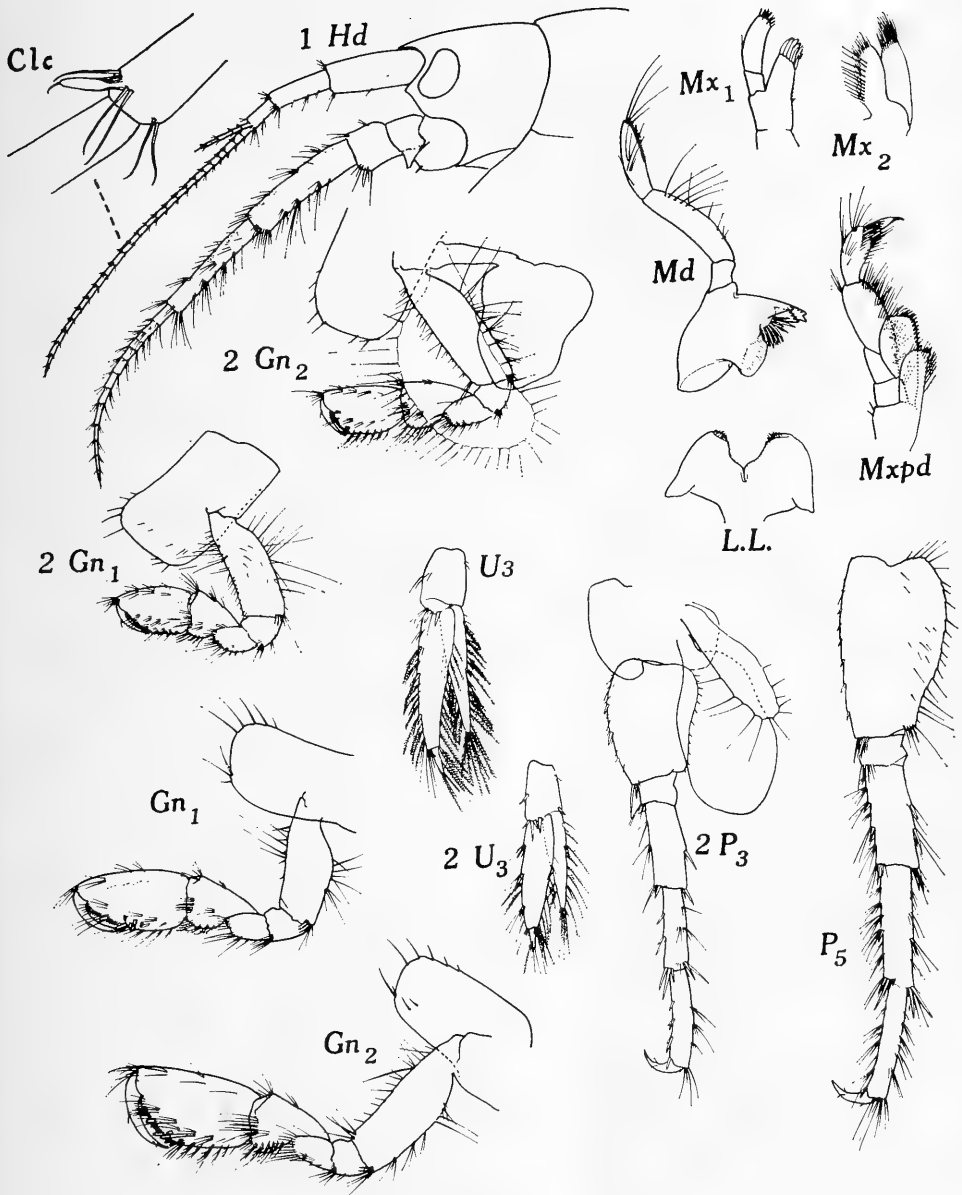


Figure 4. *Gammarus fasciatus* Say South Nation R., Ontario. 1. Male, 13.5 mm. 2. Female, 12.0 mm.

(probably four or more) fully distinct species. Such a complex would help account for the contradictory reports on the ecology, physiology, and behavior of the "species" reviewed by Clemens (p. 36).

Gammarus (Rivulogammarus) duebeni Lilljeborg

Gammarus duebenii Lilljeborg, 1851, p. 22.

Gammarus duebeni G. O. Sars, 1895, p. 205, pl. 177, fig. 1; Shoemaker, 1930, p. 114; Blake, 1933; Hynes, 1954a, 1955; Bousfield, 1955, 1956a, b.

Distribution and Ecology: Tide pools at and above MHW level and tidal fresh waters of stream mouths and short estuaries that are cool in summer, typically along rocky coasts; northern Europe, Iceland, southern Labrador, and Gulf of St. Lawrence south to Massachusetts; tolerates a wide range of salinities (1-85‰) but completes its life cycle in fresh water only in parts of Ireland and the west coast of Great Britain. Ovigerous females from January to July; life cycle of about 18 months.

Material Examined: QUEBEC: Port Alfred, Saguenay R., shore stream mouth, V. D. Vladikov, Sept. 4, 1942; Mouth of Natashquan R., E. Corbeil, June 16, 1954; Riviere St. Paul, near Blanc Sablon. NOVA SCOTIA: E.L.B., July, 1957: Cape Fourchu, Yarmouth Co.; Shag Harbour, Shelburne Co.; Western Head, Queens Co.; Peggy's Cove, Halifax Co.; Bear Cove, Halifax Co. NEW BRUNSWICK: Reversing Falls, Saint John, H. M. Rogers, Sept. 1, 1935. MASSACHUSETTS: Gloucester and E. Gloucester, high-water rock pools, U. S. N. Mus. collections, June-July, 1929.

Diagnosis (Figure 3, p. 68): *G. duebeni* is distinguished by its relatively large size (to 20 mm) and stout appendages, and by the numerous clusters of long simple setae on antenna 2, segments 4-6 of the pereopods, and dorsum of the urosome, particularly in the male. Further diagnostic characters are as follows (see also Figure 3): Eye large, reniform. Antenna 1, peduncular segment 1 with 2-3 groups of setae distally on ventral margin; segment 2 with 2-4 and segment 3 with 1-2 median ventral groups of setae respectively. Antenna 2, peduncular segments 4 & 5 subequal, liberally armed with groups of long setae set fanwise on margins.

Lower lip, inner lobe obsolete. Mandibular palp, segment 2 longest, inner margin of segment 3 distally concave, bearing about 30 comb setae, outer face with 2 groups of 4-5 setae. Maxilla 1, inner plate with 20 marginal plumose setae. Maxilla 2, inner plate with facial row of 18-20 plumose setae, terminal setae slightly offset. Maxilliped, inner plate with 4 terminal and 1 subterminal conical spine teeth and 12 plumose setae on the inner margin; segment 2 of palp nearly as wide as long.

Posterior margin of basal segment of pereopod 5 gently convex, lined proximally with 10-14 short setae, *distally nearly bare*; hind lobe obtuse, not rounded, unarmed. Posterior margins of abdominal side plates 2 & 3 with 5-6 short setae distally, lateral corners subquadrate, not acutely produced.

Gammarus (Rivulogammarus) minus Say

Gammarus minus Say, 1818, p. 376; Shoemaker, 1940, p. 390, figs. 1, 2; Hubricht, 1943, p. 685 (*partim*); Cole, 1957, p. 36, fig. 2b, c.

Gammarus propinquus Hay, 1902a, p. 224; Weckel, 1907, p. 52, fig. 12.

Gammarus purpurascens Hay, 1902b, p. 433, fig. 7; Weckel, 1907, p. 50, fig. 11.

Distribution and Ecology: Known authentically from springs, streams, and cave streams of southern Pennsylvania, south to Georgia and west to Indiana; ovigerous females throughout the year; life cycle probably of about one year, adults maturing at various sizes from 8.5 to 16 mm.

Material Examined: PENNSYLVANIA: Spring at Gables Woods, Lancaster, J. W. Price, Mar. 6, 1936 - 6 spec. (Neocotypes) ident. by C. R. Shoemaker. NMC. No. 2274. VIRGINIA: spring one mile north of Monterey, Route 220, Highland

Co.; spring near Black Pond, Fairfax Co. W. VIRGINIA: spring near Renick, Greenbrier Co. D.C.: outlet of spring, west of Georgetown.

Diagnosis (Figure 3, p. 68): As redescribed by Shoemaker (1940); a small to medium-sized species having short (3-4 segmented) accessory flagellum, weakly armed peraeopods and uropods 1 & 2, and inner ramus of uropod 3 about two-thirds the outer ramus. The following distinctive characters have also been noted: antenna 1, peduncular segments 1, 2, & 3, with 1, 3-5, and 1 ventral groups of setae respectively. Peraeopods 3 & 4, basos with distinct free hind lobe; segments 4-6 nearly devoid of setae among spine clusters; peraeopod 5, posterior margin of basos convex proximally, nearly straight distally, lined throughout with 10-15 short setae, hind lobe free but small; segments 4-6 with a few longish setae among spine clusters, especially anteriorly.

Remarks: Although *Gammarus minus* has not been recorded authentically from the study region, the proximity of the type and neotype localities to its southern border justifies the inclusion of Say's species in this report. Shoemaker (1940) was unaware that Say's original type material (though dry-mounted and fragmentary) was available in the collection of the Academy of Natural Sciences, Philadelphia (Cat. No. 2743). On probability he referred *propinquus*-type amphipods to the name *Gammarus minus* Say, and selected neotypes from a spring stream near Lancaster, Pa., some 60 miles to the west of Philadelphia.*

In collections of the National Museum of Canada (No. 2120) are seven subadult specimens of *Gammarus* taken by the writer in a small trout stream, temp. 57.5°C., just west of Tracadie, N.B., Aug. 4, 1950, that agree well with Say's meagre description of *G. minus*, even to the presence of 12 segments in the flagellum of antenna 1 of a 4.5-mm immature male. However, these differ noticeably from immature specimens of the *propinquus* type. Among other distinctive characters, they possess long, split-tipped setae on the antennae and gnathopods; 3-4 long antero-ventral setae on coxal plates 1 & 2; obsolete hind lobes on the bases of peraeopods 4 & 5; and generally more closely resemble immature specimens of *G. fasciatus*. The specific determination of this New Brunswick form must wait until descriptively adequate material has been collected.

In the writer's opinion, Shoemaker's notes on the taxonomy and ecology of *Gammarus minus* var. *tenuipes* from cave streams in W. Virginia are strongly indicative of a distinct obligate-subterranean species.

Gammarus (Rivulogammarus) acherondytes H. & M. 1940

Gammarus acherondytes Hubricht & Mackin, 1940, p. 192, fig. 2.

Distribution and Ecology: Known only from two cave streams in the southern part of the state of Illinois, in company with *Gammarus troglophilus*. Because of its subterranean habitat this species is not properly included in the scope of this paper. However, for purposes of comparison with other well-known and closely related species, *G. acherondytes* is herewith redescribed from cotype material (Morrison's Cave, Ill.) kindly loaned by the Royal Ontario Museum of Zoology and Palaeontology.

*Say's type material, consisting of two fragmentary headless specimens, has recently been examined by the writer. The gnathopods, peraeopods, pleopods, telson, abdominal side plates, and dorsal armature of the urosome were found to compare closely with those of similar-sized specimens of *G. propinquus*, thus confirming Shoemaker's synonymy.

Diagnosis (Figure 5): Combines characters of mouthparts, gnathopods, and peraeopods that are basically of the *Rivulogammarus* type, with noncalceolous, setose, second antennae, rich setation of coxal plates, and partial dorsal 'humping' of the urosome typical of the *Gammarus fasciatus* complex; distinguished by its small, weakly pigmented eyes; slender, elongate antennae; numerous groups of setae midventrally on ant. peduncular segments 2 & 3; the short uropod 1; and long dorsal spines on the urosome.

Male (17 mm): Interantennal lobe of head rather sharply angled above and below; lateral sinus moderate. Eye small, subreniform, weakly pigmented. Antennae long, slender and moderately setose. Antenna 1, ventral margin of peduncular segment 1 distally armed with short setae; peduncular segments 2 & 3 with 4-5 and 2-3 ventral groups of setae respectively. Antenna 2, peduncle longer than setose flagellum, ultimate segment longer than penultimate, margins of both with 4-5 groups of longish simple setae.

Lower lip, outer lobes laterally produced; inner lobes vestigial. Mandibular palp, terminal segment distally straight, inner margin and inner face armed with about three groups of setae. Maxilla 1, margin of inner plate with about 19 plumose setae; outer plate much larger, apex broadly rounded; palp of right side distally broadest, apex with 6 conical spine teeth and a stout seta; that of left side slender, with several stout apical setae. Maxilla 2, inner plate with facial row of 15-17 setae. Maxilliped, inner plate with 3 conical spine teeth at rounded apex; inner margin with about 10 plumose setae; outer plate broad; palp, margin of segment 2 with 2 groups of setae; segment 3 with 3 groups of setae on outer face near outer margin, and a row of pectinate setae at base of dactyl.

Coxal plate 1 with 3-4 short antero-ventral setae. Gnathopod 1, carpus, propod, and dactyl as described in the type, except palmar margin of propod bears stout median spines. Gnathopod 2, segment 2 with groups of long setae along posterior margin, proximally on anterior margin; propod long and narrow, palmar margin with median spine.

Peraeopods 1 & 2, posterior margins of segments 4-6 with 6-9 clusters of rather long setae; dactyls short, nails curved. Peraeopods 3-5 slender; segments 4-6, margins with groups of long stout spines and clusters of long setae; peraeopod 3, posterior margin of segment 2 evenly convex, hind lobe smoothly rounded; segment 6 longer than 5. Peraeopods 4 & 5 similar in shape, segment 5 longer than 6; posterior margin of segment 2 unevenly convex, lined with about 16 short setae, hind lobe free but more sharply angled, without spines.

Subequal rami of pleopods less than twice the peduncle, about 25-segmented; basal setae of inner ramus cleft apically, paired tips unequal in length, not barbed or conspicuously pectinate; inner margin of peduncles with three coupling spines, two being hooked. Abdominal side plates 2 & 3, posterior margins with a few setae distally, lateral corners acute, not produced. Uropod 1 reaching only to tips of uropod 2, rami subequal, posterior marginal spines rather large. Uropod 3 as in the type; inner ramus about four-fifths the outer; terminal segment small, without lateral setae. Telson cleft to base, dorso-lateral and terminal spines long. Female: Smaller, less attenuated, and less hairy than male. Gnathopods as in the figured allotype except that palmar margin of propodus in each has a stout spine near distal angle. Uropod 3, rami relatively short and broad; length of outer ramus about twice the peduncle.

***Gammarus* (*Rivulogammarus*) *pseudolimnaeus* n. sp.**

Gammarus fasciatus Forbes, 1876, p. 6; Weckel, 1907, p. 41 (*partim*), fig. 8 (*partim*); Huntsman, 1915 (*partim*).

Gammarus limnaeus Pentland, 1930 (*partim*); Hubricht & Mackin, 1940, p. 191 (*partim*); Hubricht, 1943, p. 684.

Distribution and Ecology: Widely distributed in the Mississippi drainage basin of east central United States, and the southwestern St. Lawrence system, from Texas and Arkansas north to Wisconsin, Ontario, and western Quebec. A species of larger rivers and lakes that breeds in tributary streams and springs that are cool in summer. Oviparous females mainly from April to July; life span of approximately 16 months. Frequently associated with *G. fasciatus* and

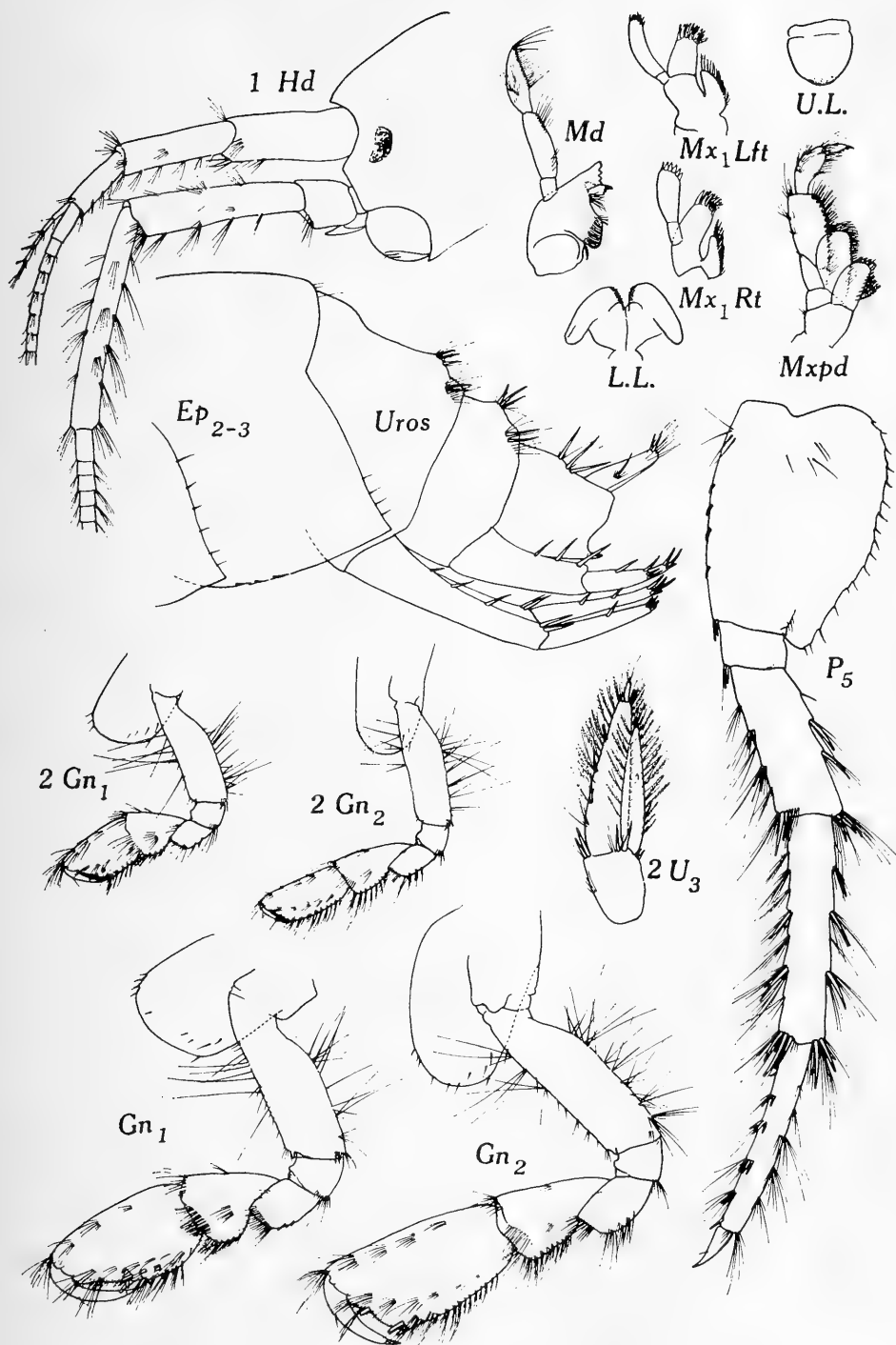


Figure 5. *Gammarus acherondytes* H. & M. Burksville, Illinois. 1. Male, 19 mm (COTYPE). 2. Female, 17 mm (COTYPE).

Crangonyx pseudogracilis in rivers and lakes and with *Hyalella azteca*, and *Crangonyx* spp. in streams. Probably seasonally migratory.

Material Examined: ONTARIO: Rideau R., below Hog's Back, Ottawa, E.L.B., May 7, 1955. Male, type; female, allotype; female, paratype. NMC No. 2110; April 30, 1955 — 1 male, topotype. NMC No. 2111. Toronto: Creek out Spadina Road; small stream, Moore Park; stream, High Park; Ashbridge's Bay, A.G.H., Dec. 5, 1912; ravine creek, N. Toronto, E.B.S. Logier, May 7, 1916. L. Ontario, dredged off Whitby; L. Huron, streams on Manitoulin I., Black Ash Creek, and Underwood Creek, near Collingwood; Ont. Dept. Planning & Development Surveys, 1946-1956: Highland Creek, Duffin Creek, Rouge R., Big Creek, Otter Creek, Little Otter Creek. NEW YORK: Hemlock Brook, Locke; Spring Creek, Caledonia (as *G. minus*, Shoem. det.); Owasco L., (as *G. minus*, Shoem. det.). WISCONSIN: Hilgen spring, 1 mile E. of Cedarsburg, Ozaukee C., July 7, 1938 (as *G. limnaeus*, L. Hubricht det.); Ashland, mouth of Fish Creek, author coll., 1957. MICHIGAN: Hog Creek, N. of Quincy, Branch Co., Aug. 1, 1938 (as *G. limnaeus*, Hubricht det.); L. Superior, Munising Wharf, auth. coll., 1957. ILLINOIS: Creek near Waukegan (as *G. fasciatus*, Weckel det.). TENNESSEE: Creek near Redfoot L., Obion Co. MISSOURI: Twelvemile Creek, St. Louis Co. (as *G. limnaeus*, Hubricht det.); spring 7 miles S. Frederickton, Madison Co. (as *G. limnaeus*, Hubricht det.); Hunter's Creek Cave, Boone Co., C. Boll, Oct., 1956, 3 — 152 meters from Cave mouth. TEXAS: Texas coast, USNM No. 155/931 (no other data).

Diagnosis (Figure 6): Closely allied to *Gammarus troglophilus* H. & M. but distinguished by the large reniform eye, the lack of calceoli on antenna 2 in the female, the concave palmar margin of gnathopod 2 in the male, the broad outer lobe of the maxilliped, the form and armature of the pereopods, the unequal rami of the pleopods, and the smaller size at maturity.

Male (14-17 mm): Interantennal lobe broad, corners rounded above and below, lateral sinus deep. Antenna 1 distinctly longer than antenna 2, relatively bare of setae; flagellum of 30 segments, peduncular segment 2 with two groups of short setae on ventral margin; accessory flagellum 5-6 segmented. Antenna 2, peduncular segments 4 & 5 subequal, armed with groups of small setae. Flagellum 10-13 segmented.

Lower lip, outer lobes somewhat asymmetrical; inner lobes weakly defined. Mandibular palp, outer face of segment 3 with three groups of longish setae; inner margin of segment 2 with distal row of about 10 long setae and proximal group of 4-5 short setae. Maxilla 1, inner plate with about 19 marginal setae. Maxilla 2, inner plate with oblique facial row of about 15 long setae. Maxilliped, inner plate with about 10 marginal plumose setae and 3 terminal spine teeth; palp large, 3rd joint, width half its length.

Coxal plate 1 widened distally, 1-2 short setae at anterior and posterior corners. Gnathopod 1, segment 5 subtriangular, convex posterior margin with 6-7 groups of setae, segment 6, palmar margin irregularly concave, very oblique, virtually continuous with posterior margin, with heavy median spine-tooth, and several small spines at posterior angle; inner face with 2-3 groups of superior lateral and 4-5 groups of inferior lateral setae; dactyl strongly curved, closing at tip. Gnathopod 2, coxal plate deeper than wide, parallel-sided; segment 5 with 7-8 posterior groups of setae and distal row of nonplumose setae; propodus large, subrectangular, several blunt spines at posterior angle; inner face with 3 groups of superior lateral and 6-8 groups of inferior lateral setae.

Pereopods 1 & 2, posterior setation rather sparse in both. Pereopods 3-5, segments 4-6 normally spinose but without corresponding clusters of long and prominent setae; pereopod 5, posterior margin of segment 2 shallow-concave distally, numerous longish setae lining it throughout and grouped proximally on inner face.

Pleopods natatory, 3rd the shortest; outer ramus (in all) about 10% longer than inner ramus, about 1.7 times the corresponding peduncle; peduncle 1 narrowest, 3 broadest, margins of each with a few groups of long setae and 3-4 coupling spines of which only 2 are hooked. Abdominal side plates 2 & 3, posterior margins lined with a few short setae, lateral corners acute but little produced posteriorly.

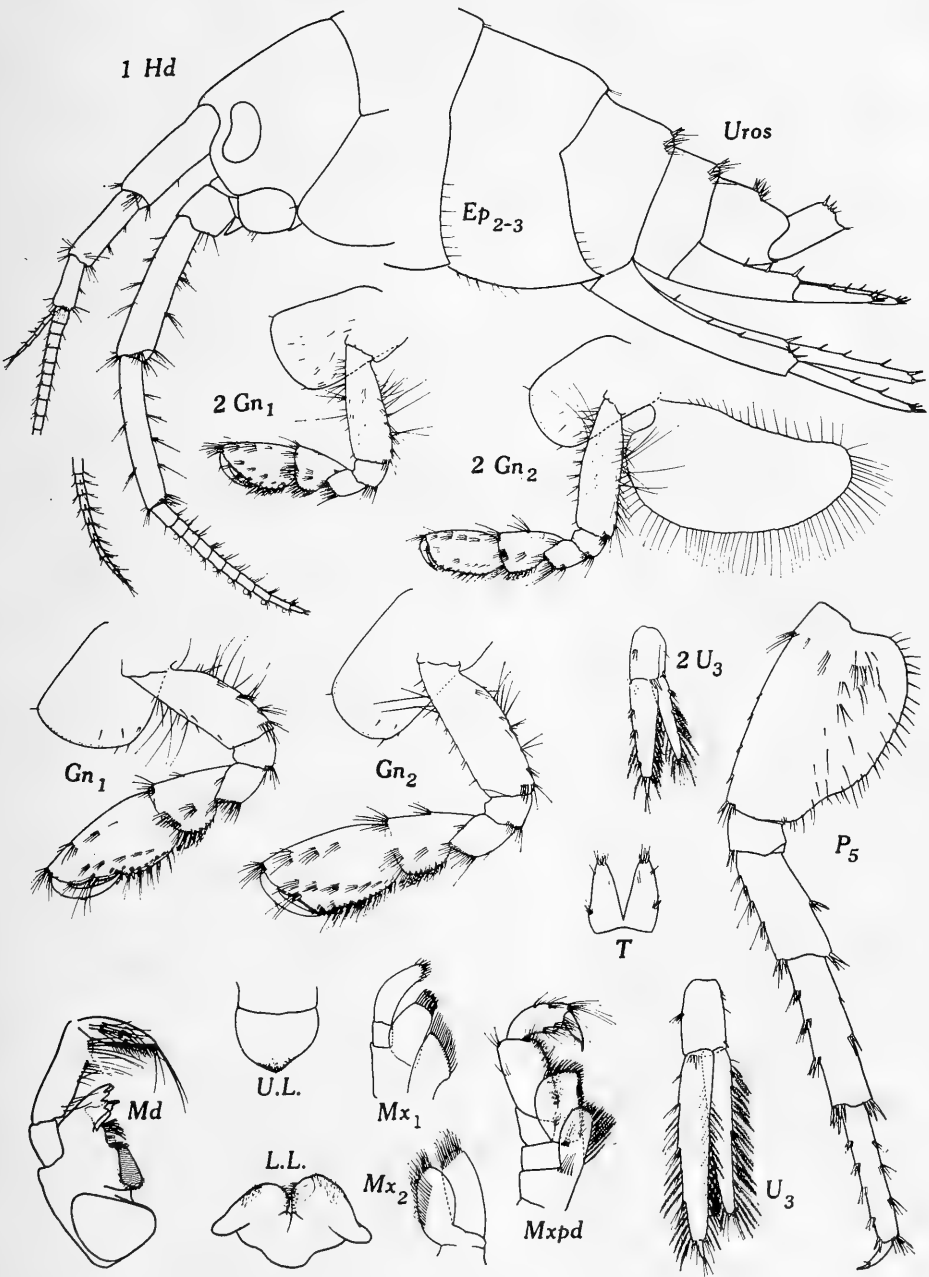


Figure 6. *Gammarus pseudolimnaeus* n. sp. Rideau R., Ottawa, Ontario. 1. Male, 17 mm (TYPE). 2. Female, 13.5 mm (ALLOTYPE).

Uropod 1 exceeding uropod 2, peduncle half again as long as subequal rami; uropod 3, rami long, broadly tapering, outer ramus about 20% longer than inner and 3 times the peduncle, natatory setae relatively short and sparse; terminal segment short, lateral margins rarely with setae. Urosome segments not noticeably 'humped' middorsally, with normal quota of median and lateral groups of spines and fine setae, 2-4 spines per cluster. Telson about as long as wide, cleft very nearly to base, groups of spines and fine setae dorso-laterally and terminally on each lobe.

Female (10-14 mm): Gnathopods generally similar but proportionately much smaller and weaker; gnathopod 1, propod without single large spine on palmar margin and only one group of spines on posterior margin. Brood lamellae on segments 2-5, largest on 3, smallest on 5, margins expanded anteriorly, lined with numerous long setae. Uropod 3 proportionately smaller than in male; outer ramus tapering distally, 40% longer than inner ramus and about twice the peduncle. In immatures of both sexes the inner ramus is proportionately much shorter than the outer.

Remarks: This species has previously been confused with *Gammarus lacustris*, *G. limnaeus*, *G. minus*, and *G. fasciatus*. Both Forbes (1876) and Weckel (1907) described and figured this species under the name *G. fasciatus* which it superficially resembles in antennal accessory flagellum, eye shape, form of pereopods, dorsal abdominal armature, and third uropods, and with which it overlaps ecologically and geographically. However, the two species are distinct on characters of the head, mouthparts, and general armature of the appendages. Hubricht and Mackin (1940, p. 191) noted differences between specimens from Rocky Mountain lakes (*G. lacustris*) and those from streams in east-central U.S.A., samples of which have been found by the writer to be *G. pseudolimnaeus*; however, the specific value of these differences was not recognized at that time. The species is readily separable from *G. minus* (*propinquus*) by the first and third uropods, accessory flagellum, basal segments of pereopods 3-5, and size at maturity.

Gammarus (Rivulogammarus) troglophilus H. & M.

Gammarus troglophilus Hubricht & Mackin, 1940, p. 189, fig. 1; Hubricht, 1943, p. 684; Weise, 1953; 1957, p. 198.

Distribution and Ecology: Known from some 30 cave streams, springs, and spring streams of Missouri and Illinois. Although barely reaching the southern limit of Pleistocene glaciation and unknown from Canada, the species is here-with more fully described, for comparative purposes, from cotype specimens (Morrison's Cave, Ill.) kindly loaned by the Royal Ontario Museum of Zoology and Palaeontology.

Diagnosis (Figure 7): Conforming to the original description of Hubricht and Mackin, with the following additions:

Male (20 mm): Interantennal lobe of head relatively narrow, anterior angles rounded, lateral sinus large. Eyes reduced, subovate, black. Antenna 1, peduncular segments each with a single median ventral group of setae. Antenna 2, peduncular segments 4 & 5 sub-equal, bearing prominent groups of longish setae (also on flagellum).

Lower lip, inner lobes weak. Mandibular palp, inner margin of segment 2 with 6-7 setae distally and proximally; inner margin of segment 3 distally concave. Maxilla 1, inner plate with about 16 marginal setae; palp of right side broadening distally to 6 or 7 short spine teeth; left palp bearing several short stiff setae on bluntly rounded apex. Maxilla 2, inner plate with facial row of about 10 setae. Maxilliped, inner plate with 3 conical spine teeth (innermost longest) and small subterminal spine, and about 8 marginal plumose setae; outer plate long, narrow, inner distal corner not rounded; palp, 3rd and 4th segments combined are longer than 2nd.

Gnathopods essentially as described, except that the slightly concave palmar margin

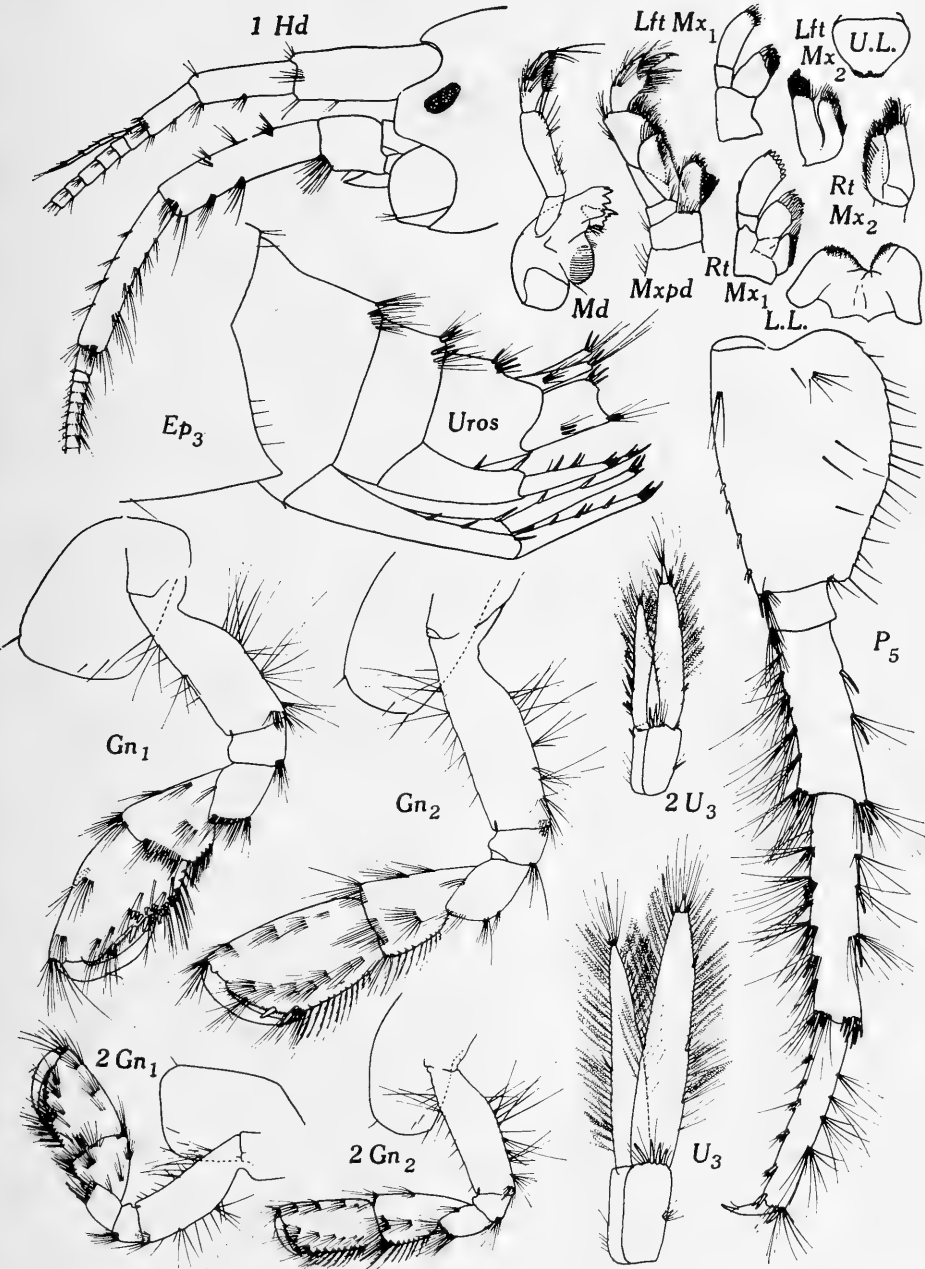


Figure 7. *Gammarus troglophilus* H. & M. Burksville, Illinois. 1. Male, 20 mm (COTYPE) 2. Female, 15 mm (COTYPE).

of the first gnathopod bears two stout widely separated spines, and the shallowly convex palmar margin of gnathopod 2 bears one strong spine near posterior angle.

Peraeopods 1 & 2 rather slender, posterior margins of segments 4-6 in each armed with several groups of long setae. Peraeopods 3-5 long and fairly robust, segments 4-6 armed anteriorly and posteriorly with several clusters of spines and numerous long setae; peraeopod 5, convex posterior margin of basos (segment 2) with about 16 longish setae and a few scattered setae on its inner face. Coxal gills on segments 2-7, not decreasing markedly in size posteriorly.

Rami of pleopods almost exactly equal, length about 1.7 times the peduncle; 3-4 coupling spines on inner margin of peduncle, of which only 2 are hooked. Abdominal side plates 2 & 3, posterior margins with a few setae, lateral corners scarcely produced posteriorly.

Urosome segments dorsally armed with median and lateral groups of stout spines and numerous long setae. Uropod 3, rami long and tapering, inner about five-sixths the outer which is three times the peduncle. Telson cleft to base.

Female (15 mm): Flagellum of antenna 2 with small calceoli on proximal segments. Gnathopod 1, palmar margin of propodus with 2-3 stout spines, that of gnathopod 2 smooth. Brood plates on segments 2-5 inclusive, immature in specimen examined. Uropod 3, outer ramus twice the length of the peduncle.

Remarks: For details of the life history and ecology of this remarkable amphipod the reader is referred to two recent papers by Weise (1953, 1957). Hubricht & Mackin (1940) noted the occurrence of *G. troglophilus* in springs with *G. limnaeus* (probably *G. pseudolimnaeus*) and had no difficulty in separating the two forms.

Gammarus lacustris lacustris G. O. Sars

Gammarus lacustris G. O. Sars, 1864, Shoemaker, 1955, p. 47.

Gammarus limnaeus S. I. Smith, 1874, p. 608, pl. II, figs. 5, 6 (*partim*); Weckel, 1907, p. 42 (*partim*); Shoemaker, 1920, p. 16E; Johansen, 1920, p. 129 (*partim*); Saunders, 1933, p. 247, fig. 2c; Hubricht and Mackin, 1940, p. 191 (*partim*); Hubricht and Harrison, 1941, p. 330.

? *Gammarus robustus* S. I. Smith, 1874, p. 610, pl. 2, figs. 7-12.

Gammarus pulex G. O. Sars, 1895, p. 503, pl. 177.

Distribution and Ecology: Cold lakes, tundra ponds, sloughs, and their outflows; from Baffin Island and the Hudson Bay drainage basin west to the Yukon and Alaska, south through the Midwest and the Rocky Mountains to New Mexico and California; northwestern Europe. Ovigerous females in late spring and early summer; life cycle of about 15 months.

Material Examined: NORTHWEST TERRITORIES: C. A. E. material from Dolphin and Union Straits, 1915-16 (as *G. limnaeus*, Shoemaker, 1920); L. Nettilling and L. Pagutaktu, D. R. Oliver, 1954-1955; Charlton I., James Bay, F. Johansen. BRITISH COLUMBIA: Collections of Pacific Biological Station (material of Saunders, 1933) from Vancouver I., incl. Malahat L., Pin L., Tower L., and Garibaldi L., and the mainland incl. Paul L., Six Mile L., and Cottonwood L. (near Nelson), and Brent's L. (near Summerland); L. Audy (Rocky Mountain Park); lake outflow near Cranbrooke; N. Fork Moose R. (as *G. fasciatus*, Weckel det.); small lake at 4000 ft, UBC Botanic Reserve; also from Sink L., near Stephen, J. B. Tyrrell, 1883. ALBERTA: Red Deer and Battle R. District; Third Vermilion L. SASKATCHEWAN: Several Lakes, D. S. Rawson and survey parties, 1948-56: Kostuchenko, Pike, Matador, Katepwa, Last Mountain, Murray, Waterhen, Sturgeon, Wakaw, L. la Ronge, Athabaska, and Reindeer; also Reed L., auth. coll., 1957. MANITOBA: Fort Churchill, F. P. Ide., 1954; Winnipeg Beach, L. Winnipeg, auth. coll., 1955. ONTARIO: Fort Severn, Patricia District, W. B. Scott, 1940; Mattagami R., near Smoky Falls. QUEBEC: L. Aigneau, southwest of Ungava Bay, D. R. O., 1954; Port Burwell, J. S. Bleakney, 1952; Cape Hope's Advance, Hudson Strait. IDAHO: Lake 1 mile north of Franklin. WYOMING: Yellowstone L., Yellowstone National

Park. CALIFORNIA: Lakes of Owens R. drainage basin (Mildred L., etc.), Bishop, N. Reimers coll., 1954. NEW MEXICO: Headwaters of Zuni R., McKinley Co., (as *G. limnaeus*, Hubricht det.).

Diagnosis (Figure 8): North American material is similar to that of northwestern Europe in the small, subrotund eyes, short accessory flagellum (2-4 segments), subquadrate (or acute but unproduced) lateral corners of the abdominal side plates, the singly spaced dorso-lateral abdominal spines (not in groups of 2-4 as in *limnaeus*) and the relatively short, sparsely setose, terminal segment of the outer ramus of uropod 3. However, the ventral margins of the abdominal side plates tend to be more setose and the lateral corners somewhat more acute, and the eye is not as close to the anterior margin of the head.

Remarks: Smith's material of *G. limnaeus* from Colorado is very probably *G. l. lacustris*. The identity of his *G. robustus* from the same region cannot be ascertained without examination of the original material. The writer has seen no material comparing in shape and armature of the propods of the gnathopods with Smith's corresponding figures of *robustus*.

Gammarus lacustris limnaeus S. I. Smith

Gammarus lacustris S. I. Smith, 1871, p. 453; Bousfield, 1956, p. 140.

Gammarus limnaeus S. I. Smith, 1874, p. 651, pl. 2, figs. 6, 7; Weckel, 1907, p. 42, fig. 9 (*partim*); Huntsman, 1915, p. 151, fig. 4a; Johansen, 1920, p. 129 (*partim*); Pentland, 1930 (*partim*); Hubricht & Mackin, 1940, p. 191 (*partim*); Hubricht, 1943, p. 684 (*partim*)?

Distribution and Ecology: Known authentically only from the St. Lawrence drainage basin, from western Ontario to eastern Quebec and Newfoundland. Occurs in large lakes (Superior, Huron, Michigan), and smaller lakes (Nipigon, Nipissing, Simcoe) and their outflows, and in marshes, swamps, swamp streams and springs that are cool to cold in summer; from the shore line to more than 60 ft in depth; under stones, among algae, bottom detritus and weeds. Oviparous females from April to August; life history of about 15 months.

Material Examined: ONTARIO: author collections from small lake near Macdiarmid, Nipigon Provincial Park, and Thessalon beach, L. Huron; L. Nipigon, dredged, F. B. Adamstone, 1921; L. Superior, Ste. Ignace I., 8-13 fath., S. I. Smith, summer, 1871 (topotypes); also lotic water collections of Ont. Dept. Planning and Development, and author from: small tributary of Little Otter Creek, 1 mile north of Staffordville, Elgin Co.; Rocky Saugeen R., 7 miles east of Flesherton, Grey Co.; Credit R., 4 miles west of Alton, Peel Co.; Moira R. tributary, 6½ miles west of Foxboro, Hastings Co. MINNESOTA: L. Bemidji, Beltrami Co., author coll., 1957. QUEBEC: author collections, 1953, from small lake 4 miles west of Cap Chat, and Grand Etang, Gaspé region; lake at Port Menier, Anticosti I. NEWFOUNDLAND: Small lake at Cook's Harbour, Belle Isle Strait, E. Palmén, 1949.

Diagnosis (Figures 8, 9): As described by Smith and Weckel, with the following additions: Male (14-18 mm): Interantennal lobe of head fairly broad, anterior corners rounded, lateral sinus deep. Eyes somewhat variable but usually subreniform, deeper than wide, black. Antenna 1, accessory flagellum with 3-4 segments, the last very small; peduncular segment 2 with 1-2 groups of short setae on ventral margin.

Upper lip rounded below and finely setose. Lower lip, inner lobes weak. Mandibular palp, segment 2, inner margin lined with 10-12 setae, longest distally; segment 3 somewhat shorter, tapering distally, inner margin distally concave, inner face with two groups of 2-3 setae. Maxilla 1, inner plate with up to 24 marginal setae; palp of right side with 5-7 apical spine teeth and a few setae, that of left side with several stiff apical setae. Maxilla 2, inner plate with facial row of 20 long setae subparallel to inner margin. Maxilliped, inner plate with 3 terminal spine teeth and 8-10 marginal plumose setae; outer plate distally rounded; palp relatively short, segment 3 shorter than 2.

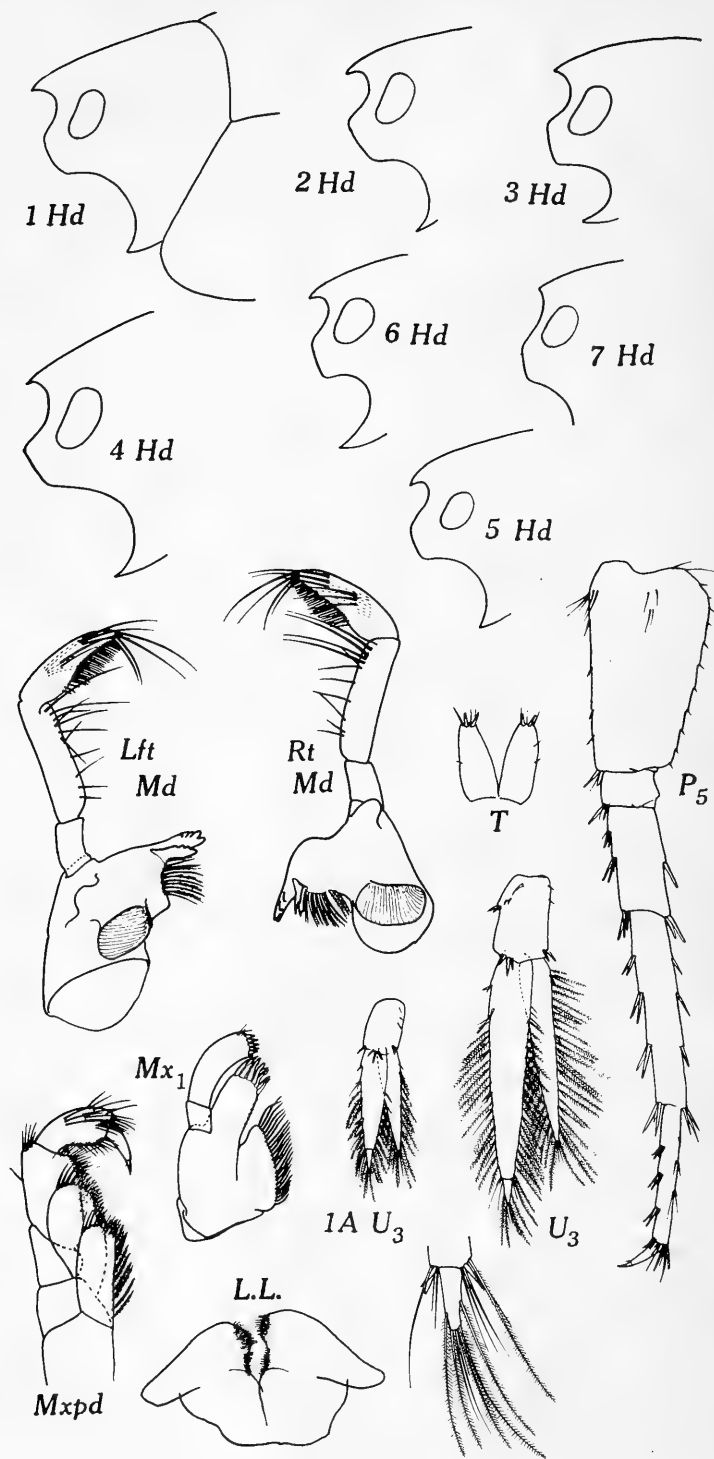


Figure 8. *Gammarus lacustris limnaeus* Smith 1. Lake near Macdiarmid, Nipigon Provincial Park, Ont. Male, 17 mm. 1A. Female, 14 mm. 2. Seven Islands Lake, Gaspé, Que. Male, 16 mm. 3. Female, 14 mm. 4. Port Menier Lake, Anticosti I., Que. Male, 19 mm. 5. Port Burwell, Quebec. Male, 15 mm. 6. Anglesey, Wales. Male, 13.5 mm. 7. Female 13.5 mm.

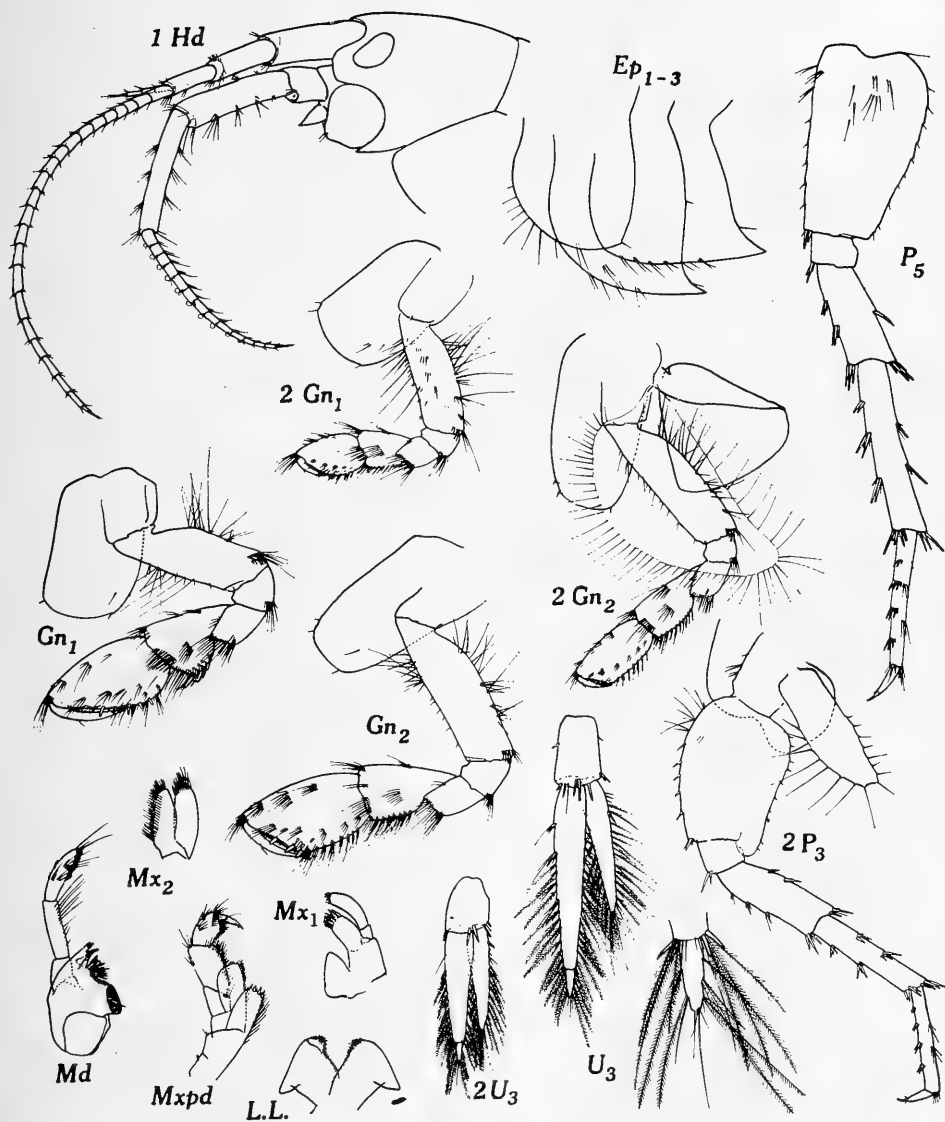


Figure 9. *Gammarus lacustris limnaeus* Smith Little Otter Creek, Elgin Co., Ontario. 1. Male, 15 mm. 2. Female, 13 mm.

Coxal plates 1 & 2 each with 1-2 antero-ventral and 1 postero-ventral setae. Gnathopods as in the type; propodus of gnathopod 2 in the male with 3 groups of superior-lateral and 5-6 groups of inferior-lateral setae. Peraeopod 1 somewhat longer and heavier than 2; posterior margins of segments 4-6 lined with four or more clusters of long setae, some longer than segment 6. Peraeopods 3-5 rather slender, 4th very slightly longer than 5; segments 4-6 lacking long setae; segment 2 (basos) widest proximally, hind margin of peraeopod 3 & 4 slightly concave, that of 5 nearly straight, lined with about 10-12 short setae and a few setae on inner face of basos; segment 6 about three-fourths segment 5.

Pleopods 1 & 2 subequal, 3rd shortest; rami subequal, about 20-segmented, nearly twice the length of respective peduncles; basal setae of inner ramus stout, distally forked, one tip simple, the other pectinate; peduncles with 3-5 coupling spines of which two are hooked. Abdominal side plates 2 & 3, posterior margins oblique, lateral corners acutely produced, ventral margins gently convex, lined with 4-6 longish setae, some in groups. Dorsal median and lateral spines on urosome segments 1-3 total 14-17 (up to 24 in lotic water specimens), typically 2 spines per group, one or both median spines on urosome 3 lacking. Uropod 3, rami long, slender, inner ramus about four-fifths the outer which is three times the peduncle; terminal segment of outer ramus, lateral margins with plumose setae singly inserted or in groups with simple setae. Telson cleft to base, lobes with a few lateral setae and apical spines.

Femal (14 mm): Generally shorter-limbed than male. Abdominal side plates, lateral corners a little less strongly produced. Uropod 3, inner ramus nearly equal to basal segment of outer ramus.

Remarks: The present material of *G. l. limnaeus* is remarkably similar to material of *G. l. lacustris* from the British Isles (Anglesey), kindly supplied by Dr. H. B. N. Hynes. The writer has concluded, however, that differences in eye shape, antennal setation, shape and armature of abdominal side plates, and dorsal abdominal spination are regionally consistent and deserving of subspecific recognition. Lotic-water specimens show a tendency to more acutely produced abdominal side plates, more numerous dorsal abdominal spines, shorter pleopods, and, in uropod 3, to more unequal rami and a more setose terminal segment of the outer ramus.

Anisogammarus (Eogammarus) ramellus (Weckel)

Gammarus ramellus Weckel, 1907, p. 38, fig. 7.

Gammarus confervicolus Saunders, 1933, p. 248, fig. 2e.

Anisogammarus ramellus Shoemaker, 1942, p. 4; Carl *et al.*, 1952; 1956, p. 6.

Anisogammarus (Eogammarus) ramellus Barnard, 1954, p. 16, pl. 15.

Distribution and Ecology: Mainly in small coastal streams and lakes with direct access to the sea but above HW level; occasionally also in tidal fresh and oligohaline-brackish waters; American-Pacific coast from California to British Columbia. Oviparous females from March to August; life cycle probably of one year.

Material Examined: QUEEN CHARLOTTE ISLANDS, author coll., 1957: small steep streams near Skidegate Mission and at Queen Charlotte City, Graham I., and Alliford Bay, Moresby I. VANCOUVER I.: author coll., 1955, from small stream at Wreck Bay (Ucluelet); east side of Kennedy L.; and Keighley's stream, Departure Bay. Collections of Pacific Biological Station (Saunders, 1933) from Butchart's Gardens, Victoria; Keighley's well; and Anderson L. CALIFORNIA: Stream mouth at Biological Station, Mendocino, author coll., 1955.

Diagnosis (Figure 10): Male (12 mm): Interantennal lobe truncate, corners rounded. Eye rather small, broad-reniform, black. Antenna 1, peduncular segments 1-3 with 2, 2, and 1 ventral groups of short setae respectively; flagellum of 22-25 segments; accessory flagellum of 5-6 segments. Antenna 2, peduncular segments 4 & 5 slender, setose, subequal; flagellum of 12-14 segments, without calceoli.

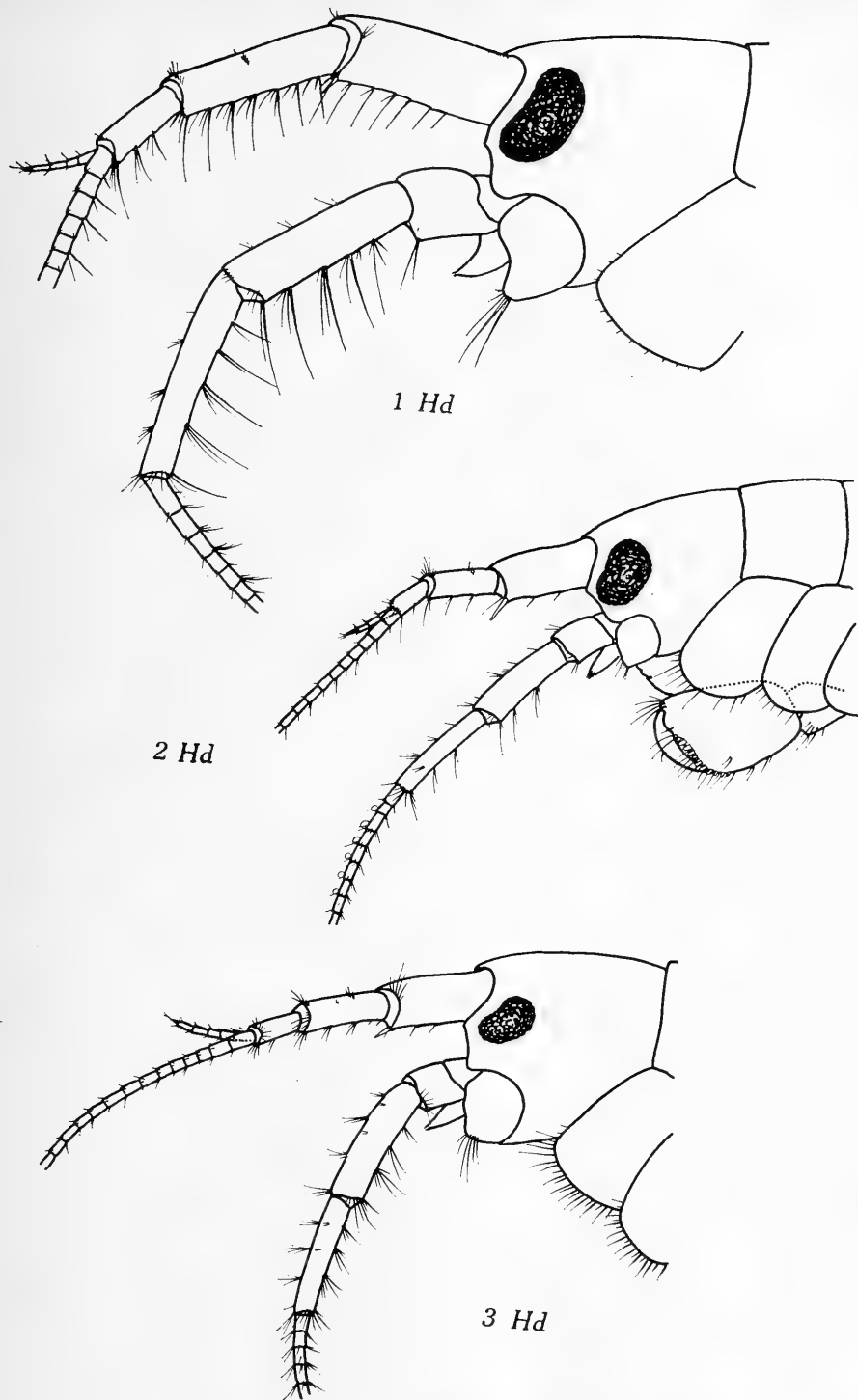


Figure 10. *Anisogammarus locustoides* (Brandt) Queen Charlotte City, Graham I., B.C. 1. Male, 14 mm.
Anisogammarus confervicolus (Stimpson) Skidegate Mission, Graham I., B.C. 2. Male, 11 mm.
Anisogammarus ramellus (Weckel) Skidegate Mission, B.C. 3. Male, 12 mm.

Lower margin of coxal plates 1 & 2 lined with numerous setae. Posterior margins of abdominal side plates 2 & 3 with several longish setae.

Material from British Columbia, particularly at the mouths of streams, differs from that of Mendocino in the shorter ventral peduncular setae of antenna 1, the more convex outline and longer setae of the posterior margin of the basos of pereopods 3-5, and the presence (in some males) of short paired spines among the dorsal setae of pleon segments 2 & 3.

Remarks: The species is closely related to *Anisogammarus oregonensis* Shoemaker (1944) recorded from seaside creeks and lakes in southern Oregon but not yet in Canada.

Anisogammarus (Eogammarus) confervicolus (Stimpson)

Gammarus confervicolus Stimpson, 1856; Holmes, 1908, vol. 10, p. 239.

Melita confervicola Stebbing, 1906., p. 428.

Anisogammarus confervicolus Saunders, 1933, p. 248 (*partim*); Carl, 1937.

Anisogammarus (Eogammarus) confervicolus Barnard 1954, p. 9, pls. 9-10.

Distribution and Ecology: Brackish bays and estuaries from Alaska to California; frequently in spray pools fresh to the taste and above normal HW, and mouths of f.w. streams, in company with *A. locustoides*, *Corophium spinicorne* and *Paramoera* spp. Previously recorded in Canada from Vancouver I., and Lost Lagoon, Vancouver, B.C. Ovigerous females from May to August.

Material Examined: QUEEN CHARLOTTE ISLANDS, author coll., 1957: spray pools and mouths of streams on W. coast Graham I. at Mountain Creek, Shields Bay; S. of Stiu Pt., Cartwright Sound; N. side Gudal Bay; Gudal Creek; S. side Gudal Bay; also mouth of small stream E. of Cape Fanny, Moresby I.; stream mouth near Skidegate Mission and at Queen Charlotte City, Graham I., and N. side of Copper Bay, Moresby I. PRINCE RUPERT, author coll., 1957: stream mouth in Hay's Inlet. VANCOUVER I., author coll., 1955: spray pools at N.W. end Long Beach and Webb's Pt.; mouth of Goldstream, head of Finlayson Arm; stream mouths at heads of Comox Harbour, Nanoose Bay, and Ladysmith Harbour; Berkeley Stream, Departure Bay. B.C. MAINLAND, author coll., 1955: mouth of stream, Kelly Bay; stream mouth at Sechelt.

Diagnosis (Figure 10): Male (11 mm): Close to *A. ramellus* but distinguished by several characters of the head region. Interantennal lobe oblique, upper angle sharp, minutely notched, lower rounded. Eye moderately large, broad-reniform, black, anterior. Antenna 1 a little longer than antenna 2; peduncular segments 1-3 successively smaller, typically with 3, 2, & 1 ventral groups of short setae respectively; flagellum of 20-22 segments; accessory flagellum with 3-4 segments. Antenna 2, peduncle stouter but less setose than in *A. ramellus*; flagellum of 11 segments, proximally with calceoli.

Coxal plates with fewer marginal setae and pleon segments 1-3 without dorsal groups of setae (or spines). Abdominal side plates 2 & 3, posterior margins with one or two setae.

Anisogammarus (Eogammarus) locustoides (Brandt)

Gammarus locustoides Brandt, 1851.

Gammarus (Marinogammarus) locustoides Gurjanova, 1951, p. 771, fig. 537.

Anisogammarus (Eogammarus) locustoides Barnard, 1954, p. 12, pl. 11.

Anisogammarus locustoides Carl et al., 1956, p. 6.

Distribution and Ecology: Mouths of fresh-water streams exposed to lotic fresh waters at low tide; Kamchatka, Alaska, and British Columbia; previously recorded in Canada from a fresh-water stream, East Bunsby Islands, west coast Vancouver Island. Ovigerous females March to June; life cycle of about 15 months.

Material Examined: QUEEN CHARLOTTE ISLANDS, author coll., 1957: stream mouths on W. coast Graham I. at Mountain Creek, Shield's Bay, and S. of

Stiu Pt., Cartwright Sound; stream mouths on E. coast Graham I., W. of Skidegate Mission and W. of Queen Charlotte City; also N. side of Copper Bay, Moresby I. B.C. MAINLAND: Collections of Pacific Biological Station, "Work Canal" (near Prince Rupert), July 21, 1906 — 1 male specimen.

Diagnosis (Figure 10): Male (14 mm): Interantennal lobe, anterior margin concave, upper corner sharp, lower rounded. Eye large, reniform, black. Antenna 1, peduncular segments 1-3 stout, with 6, 6, and 2 ventral groups of longish setae respectively; flagellum of 25-30 segments; accessory flagellum with 5-6 segments. Antenna 2, peduncular segments 4 & 5 strong, subequal, each with 4-5 ventral groups of long setae; flagellum of 15 segments, without calceoli.

Coxal plates 1 & 2 without conspicuous marginal setae. Pleon segments 1-3 dorsally smooth; posterior margins of side plates 2 & 3 convex, lined with short setae.

Crangonyx Section

Crangonyx anomalus Hubricht

Crangonyx anomalus Hubricht, 1943, p. 687, pl. I.

Distribution and Ecology: Known only from limestone springs of southern Ohio and Kentucky.

Remarks: Recorded localities are at the southern limit of Pleistocene glaciation in Ohio but south of the St. Lawrence drainage basin. The writer has seen no material of this species. Hubricht's figures for the gnathopods and uropods indicate a close relationship with *C. forbesi* (H. & M.), also a stream-dwelling species but of more southerly distribution. The broadly expanded basal segments of pereopods 3-5, the spinose telson, the strongly curved outer ramus of uropod 2 in the male, and the fact that males are larger than females, are specifically distinctive.

Crangonyx forbesi (Hubricht & Mackin)

? *Crangonyx gracilis* Forbes, 1876, p. 6 (*partim*).

Eucrangonyx forbesi Hubricht & Mackin, 1940, p. 196, fig. 5.

Crangonyx forbesi Hubricht, 1943, p. 689.

Distribution and Ecology: Widely distributed in springs and cave streams of the Mississippi drainage basin, from Arkansas north to Illinois. Ovigerous females March to May; seasonally migratory.

Diagnosis (Figure 11): As several characters of major taxonomic value were omitted in the original description, the species is herewith redescribed and refigured in order to facilitate comparison with several new forms recorded in this study. Through the kindness of the Royal Ontario Museum of Zoology and Palaeontology, cotype material (Kirkwood, Missouri) has been made available for this purpose.

Female (17 mm): Interantennal lobe of head very broad, corners broadly rounded. Eyes small, black, irregularly subrotund. Antennae armed with numerous groups of short setae, particularly on peduncular segments. Antenna 1, peduncular segments 1 & 2 subequal, 3rd not more than half the 2nd, all relatively broad and heavy. Antenna 2, peduncular segment 4 longer than 5.

Lower lip, outer lobes considerably produced and narrowing laterally almost to a point. Mandibular palp, outer margin of segment 3 with 3 groups of short setae. Maxilla 1, inner plate with 9 marginal plumose setae. Maxilla 2, inner plate with facial row of about 10 stout setae diverging obliquely from inner margin. Maxilliped, inner plate bearing 6-7 short apical spine teeth and about 6 marginal plumose setae; palp relatively short, segment 2 nearly as wide as long.

Coxal plate 1 somewhat broadened distally, corners rounded, ventral margin lined with 20-25 short setae. Segment 3 & 4 of gnathopod 1, posterior margins lacking fine pectination

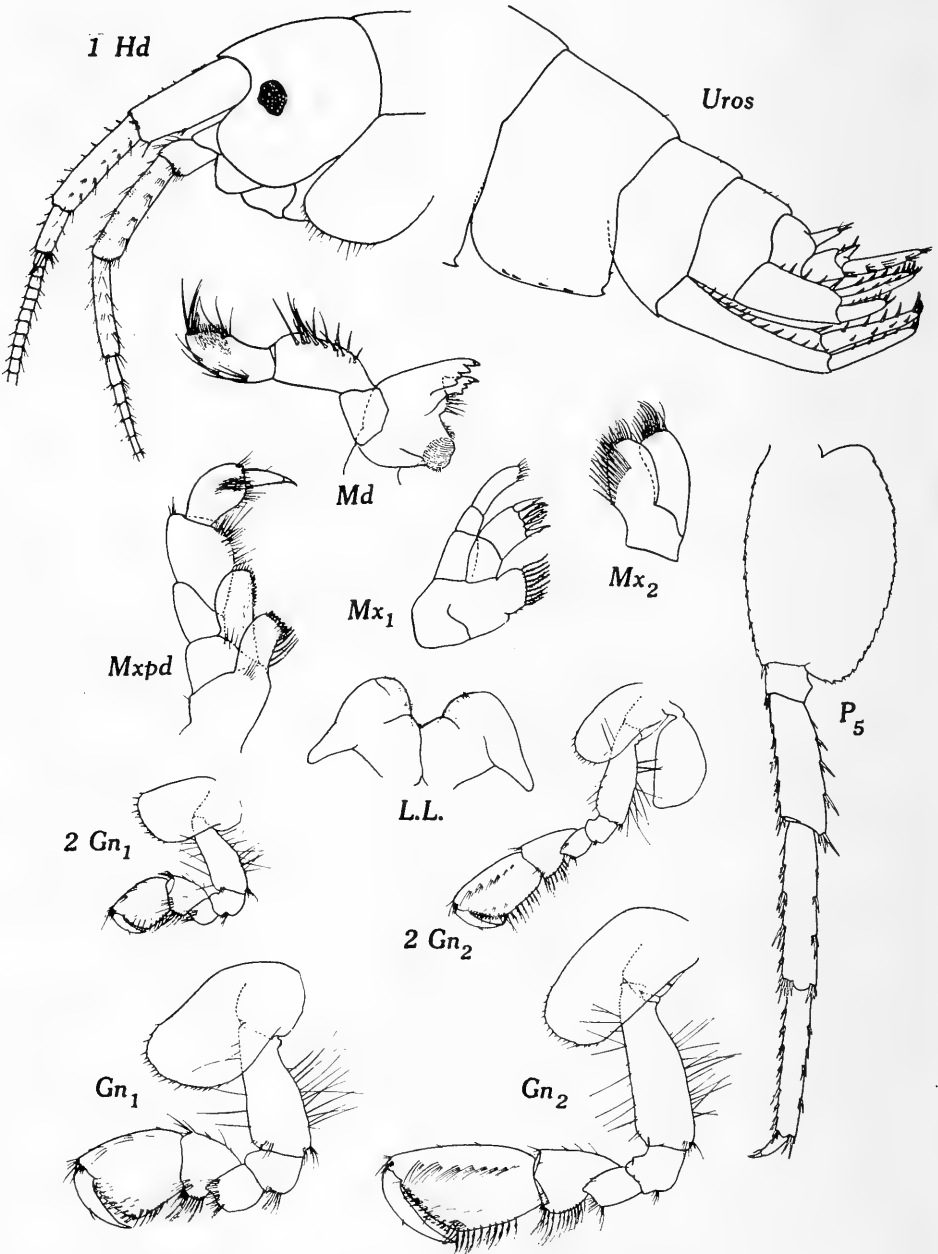


Figure 11. *Crangonyx forbesi* (H. & M.) Kirkwood, Missouri. 1. Female, 17 mm (COTYPE).
2. Male, 11.0 mm (COTYPE).

(in either sex). Gnathopod 2, coxal plate somewhat narrowing distally, ventral margin setose; inner margin of dactyl without minute setae. Peraeopod 1 not longer than peraeopod 2; segments 4-6 posteriorly lined with numerous short spines. Peraeopods 3-5 relatively stout and heavy; bases of each bordered posteriorly with 20-30 fine serrations. Coxal gills on segments 2-7 inclusive; paired sternal gills on 6, two pairs on segment 7. Median sternal process on segments 2 & 3. Brood plates not developed in specimens examined.

Pleopods natatory though somewhat reduced; 1 & 2 subequal, 3rd shortest; inner ramus of all pleopods slightly longer than outer, about $1\frac{1}{2}$ times the peduncle, 10-20 segmented (basally fused), peduncle with 6-7 coupling spines. Abdominal side plates 2 & 3, lateral corners minutely mucronate, not produced posteriorly. Uropods 1 & 2 relatively short and heavy, posterior margins lined with numerous spines.

Remarks: The relatively short, stout, heavily setose and spinose antennae, peraeopods, and uropods, and the reduced pleopods are characteristic of lotic-water forms such as *C. forbesi*. The unusual female specimens of "*Crangonyx gracilis*" described by Forbes (1876) from southern Illinois may have been this species.

Crangonyx obliquus (Hubricht & Mackin)

Eucrangonyx obliquus Hubricht & Mackin, 1940, p. 195, fig. 4 (female only).

Crangonyx obliquus Hubricht, 1943, p. 689 (*partim*); Cole, 1957, p. 36, fig. 2E (*partim*).

Distribution and Ecology: The type female was taken from a creek near Clarksville, Johnson Co., Arkansas, and the species was subsequently recorded by Hubricht (1943) from Michigan and Indiana south to Louisiana and Georgia and from Kentucky by Cole (1957).

Remarks: Hubricht (1943), apparently without critical comparison of type material, has synonymized *Crangonyx richmondensis* Ellis with *C. obliquus* (H. & M.). The writer has not seen the type material of either species. As originally figured, however, the gnathopods of each are quite unlike and are strongly suggestive of two fully distinct species. The two species are readily separable on characters given in the key. In *C. obliquus* the propodus of gnathopod 1 is subovate, the palmar margin very oblique and strongly convex, the posterior margin armed with one group of setae and very short, much less than half the length of the anterior margin. The posterior border of the carpus is also very short, armed with only two groups of setae. The propodus of the second gnathopod is relatively longer, posterior margin not quite half the length of the anterior margin. Dactyls of both gnathopods are very long, strongly curved, and armed on the outer margin with three widely spaced sensory setae. The male has not been described.

Specimens labeled "*C. obliquus*" from a pond near Ann Arbor, Washtenaw Co., Michigan, kindly supplied by Mr. Hubricht, were found to be a new northern race of *C. richmondensis* (see p. 94). *C. obliquus* was described from a stream; *C. richmondensis* is essentially a species of ponds, sloughs, and their outflows. On these considerations the lotic-water records of Hubricht (1943) and Cole (1957) from Illinois, Ohio, Kentucky, Tennessee, Arkansas, and Missouri are more likely to be the true *C. obliquus* (H. & M.), whereas those from sloughs and ponds in S. Carolina, Georgia, Alabama, Mississippi, and Louisiana are probably *C. richmondensis* Ellis.

Crangonyx serratus (Embody)

? *Ampithoe dentata* Say, 1818, p. 383.

Eucrangonyx serratus Embody, 1910, p. 299, fig. 1.

Crangonyx serratus Hubricht, 1943, p. 689.

Distribution and Ecology: Known only from sloughs, ponds, and ditches of Virginia, S. Carolina, and northern Florida; probably occurring as far north as Pennsylvania in Atlantic coastal drainage systems.

Material Examined: Roadside ditch near Bower's Hill, Norfolk Co., Virginia, L. Hubricht coll., Feb. 25, 1945 — 5 males (10-11 mm), 4 ovig. females (14-16 mm).

Diagnosis (Figure 20, p. 110): A moderately large, lentic-water species, distinguished by the deeply serrated posterior margins of the basal segments of pereopods 3-5. The gnathopods in both sexes are also diagnostic; palmar margins long, strongly convex, very oblique, and heavily spinose; dactyls armed on the outer margin with 6-8 well-spaced sensory setae. Lateral corners of abdominal side plates, particularly 2, strongly produced posteriorly. Telson much longer than wide, cleft more than half way to the base, and bearing spines dorsally as well as terminally on each lobe.

The mouthparts are also distinctive but show interesting similarities to those of the subterranean *C. dearolfi* Shoemaker (1942). Lower lip, inner lobes relatively well demarcated; outer lobes relatively deep. Mandibular palp, terminal segment distally narrowing, outer margin lined with 5-6 longish setae. Maxilla 1, inner plate with 5-6 marginal setae; outer plate short, truncated apex bearing 7 slender and weakly pectinate spine teeth. Maxilla 2, plates short; inner plate broad, with facial row of 4-5 plumose setae set obliquely to inner margin. Maxilliped, inner plate short, with 3 tall apical spine teeth, and 2-3 short plumose marginal setae; palp strong, dactyl slender.

Remarks: Say's "*Ampithoe dentata*" from fresh-water marshes of South Carolina is probably referable to immature stages of *Crangonyx serratus* or similar species. Mr. C. R. Shoemaker has recently pointed out (personal communication) that Say's statement (1818, p. 383) "posterior edge of dilated thighs conspicuously serrated with from eight to twelve teeth" pertains to this species and not to *Hyaella azteca* Saussure (to which Stebbing, 1906, tentatively assigned Say's species). In *H. azteca* only the last pair of thighs (basos of pereopod 5) are serrated, and these not prominently so (Figure 20 (1)). Although Say defined the genus "*Ampithoe*" as lacking an accessory flagellum in the first antenna (with which *Hyaella* agrees), it is more than likely that his material actually did have an obscure, minutely 2-jointed, accessory flagellum, a character easily overlooked.

Crangonyx richmondensis richmondensis Ellis

Crangonyx richmondensis Ellis, 1940, p. 3, figs. 1, 2.

Crangonyx obliquus Hubricht, 1943, p. 689 (*partim*).

Crangonyx occidentalis Bousfield, 1956a, p. 141; 1956b, p. 31.

Distribution and Ecology: Shallow margins of sloughs, ponds, bog ponds, and their outflows; eastern slopes of the Appalachians, Georgia north to Nova Scotia and Newfoundland, probably also Alabama to Arkansas. Ovigerous females from December (in the south) to June (in the north); life cycle of one year, only the immatures found during summer and fall.

Material Examined: NEWFOUNDLAND: Power's Pond, St. Philip's, H. J. Squires, July 4, 1954 — 5 adult females. NMC. No. 2128; July 18, 1955 — male and female, plesiotypes. NMC. No. 2126; 11 additional males, 11 females. NMC. No. 2127; Bog Pond, 3 miles N. of St. Shott's, Avalon Peninsula. NOVA SCOTIA: Halifax water supply pond, 3 miles W. of Halifax on Hwy. No. 3; Black R., Kings Co., stomach of trout.

Diagnosis (Figure 12, p. 92; Figure 20, p. 110): As described and figured by Ellis (1940) with the following characterization: Female (12-14 mm): Mouthparts larger and setation more strongly developed than in male. Lower lip, outer lobes produced laterally, tips rounded; inner lobes fairly broad. Gnathopods, setae of ventral margins of coxal plates short. Peraeopods 3 & 5 subequal, 4th longest; basal segments expanded posteriorly, width (in peraeopod 5) more than two-thirds its length, posterior margin convex, with 14-18 fine serrations; segment 5 slightly longer than segment 6; dactyls relatively short, about 30% of the length of the respective propods. Coxal gills on segments 2-7; paired sternal gills on segment 6, two pairs on segment 7. Median sternal process on segments 2 & 3. Brood plates on segments 2-5, smallest on 5.

Pleopods natatory, subequal; 2nd slightly the longest, 3rd shortest; inner ramus about 10% longer than outer, a little more than twice the peduncle; peduncle with 4-5 coupling spines. Abdominal side plates 2 & 3, lateral corners produced acutely.

Remarks: *C. richmondensis* is distinguished from *C. forbesi* by the more slender and less setose antennae, peraeopods, and uropods; by the more reduced mouthparts; and by the more prominent lateral corners of abdominal side plates 2 & 3. For reasons previously outlined (p. 89), the writer considers Hubricht's synonymy of this species and *C. obliquus* to be invalid, and regards *richmondensis* as the nominate race of what may prove to be the most widely distributed species of the genus in N. America.

Crangonyx richmondensis occidentalis Hubricht & Harrison

Eucrangonyx gracilis Saunders, 1933, p. 246, fig. 2a, b; ? Carl, 1953.

Crangonyx occidentalis Hubricht & Harrison, 1941, p. 331, fig. 1.

Distribution and Ecology: Recorded from bog ponds, small lakes, and their outflows on the Pacific coast of Canada and the United States, from Washington State, the Fraser valley, and Vancouver Island in the south to Prince Rupert and the Queen Charlotte Islands in the north. Ovigerous females from December to July; immatures only during late summer and fall.

Material Examined: BRITISH COLUMBIA: Vancouver I., author coll., 1955: First Nanaimo L.; Berkeley Stream, Departure Bay; Lost Lake (near P.B.S.); N.E. end of Clayoquot I. Collections of the Pacific Biological Station (as *E. gracilis*, Saunders det.) from: Berkeley stream; Millstream, Nanaimo; Rock City Pond; shallow roadside pool, 8 miles S. of Nanaimo; Tower L.; Spider L.; Whiteaker's L., Malahat; Shawnigan L.; Kennedy L.; near Tofino. Prince Rupert: Moose Creek. Queen Charlotte Islands, author coll., 1957: Lower Gudal Lake, and lake above Stiu Pt., W. Coast Graham I.; stream 4 m. N. Port Clements, *Carex* marsh at Yakan Pt., and stream near Lawn Pt., N. & E. coasts of Graham I.; Bog pond at Cape Chroustacheff and Mosquito Lake, E. side Moresby I. WASHINGTON: Echo L., near Everett (type locality). Plantation Pond, King Co., C. H. Harrison, May 13, 1939—20 adult specimens. NMC. No. 2129.

Diagnosis (Figure 12): Essentially as described by Hubricht and Harrison but differing from the nominate form of *C. richmondensis* in the narrower and less serrated basal segment of peraeopod 5, the shorter third uropods, and by the more deeply cleft and less spinose lobes of the telson; and from the eastern race *laurentianus* by the more sharply produced lateral angles of abdominal side plates 2 & 3, the more acutely pointed outer plate of the maxilliped, and the slightly smaller size at maturity.

Female (13 mm): Lower lip broad, outer lobes apically rounded. Mandibular palp, segment 2 with about 14 stout setae in two rows on inner margin; segment 3, inner face with longish setae in small groups near outer margin. Maxilla 1, inner plate small, rounded, with four marginal plumose setae. Maxilla 2, inner plate short and broad, one or two short plumose setae on inner face near apex. Maxilliped, inner plate very short, obliquely truncated, with 5 short apical spine teeth and several stiff setae, and 3-4 short plumose

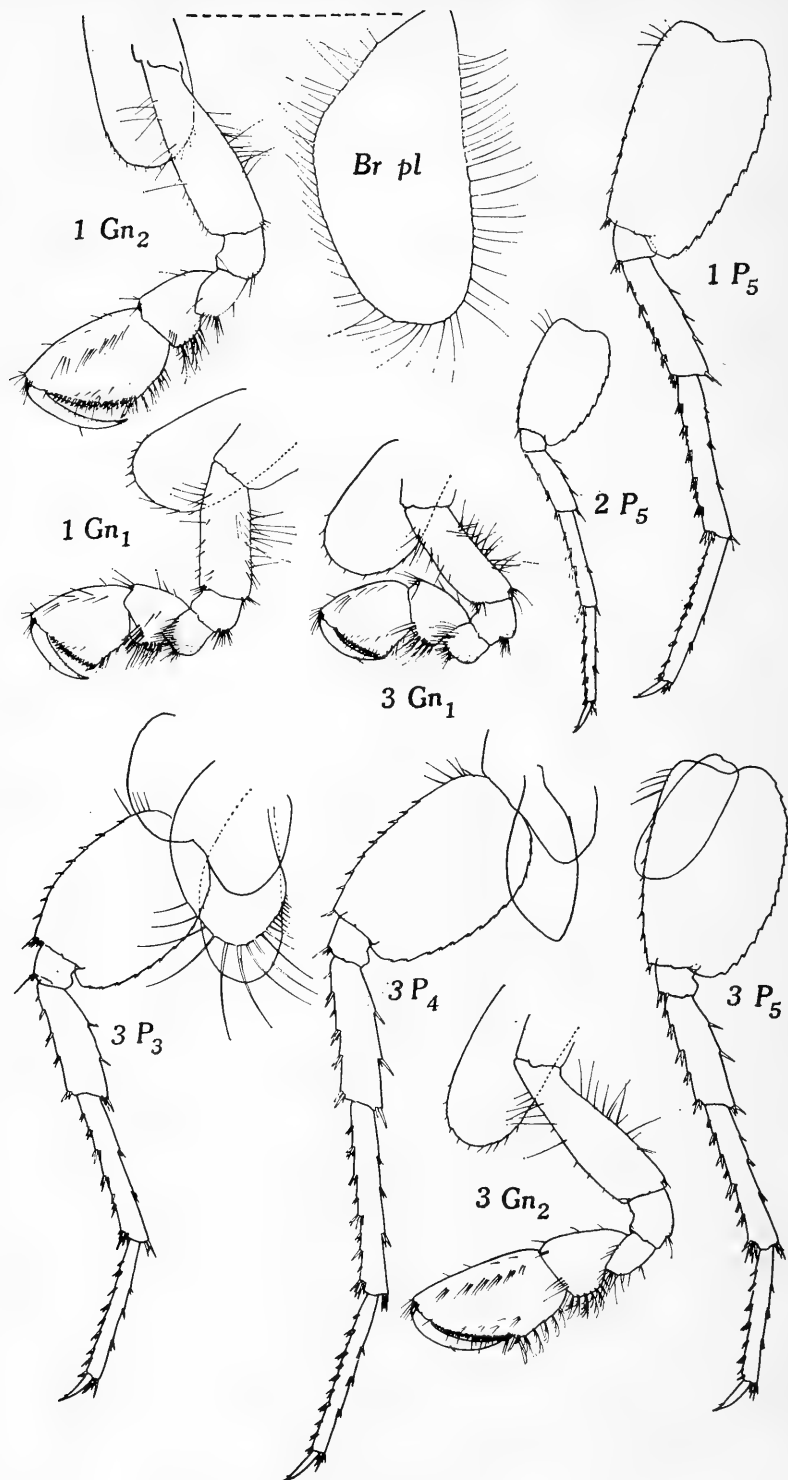


Figure 12. *Crangonyx richmondensis occidentalis* H. & H. Plantation Pond, King Co., Wash. 1. Female, 13.5 mm. 2. Male, 10.0 mm. *Crangonyx richmondensis richmondensis* Ellis Power's Pond, St. Phillip's, Nfld. 3. Female, 13.5 mm.

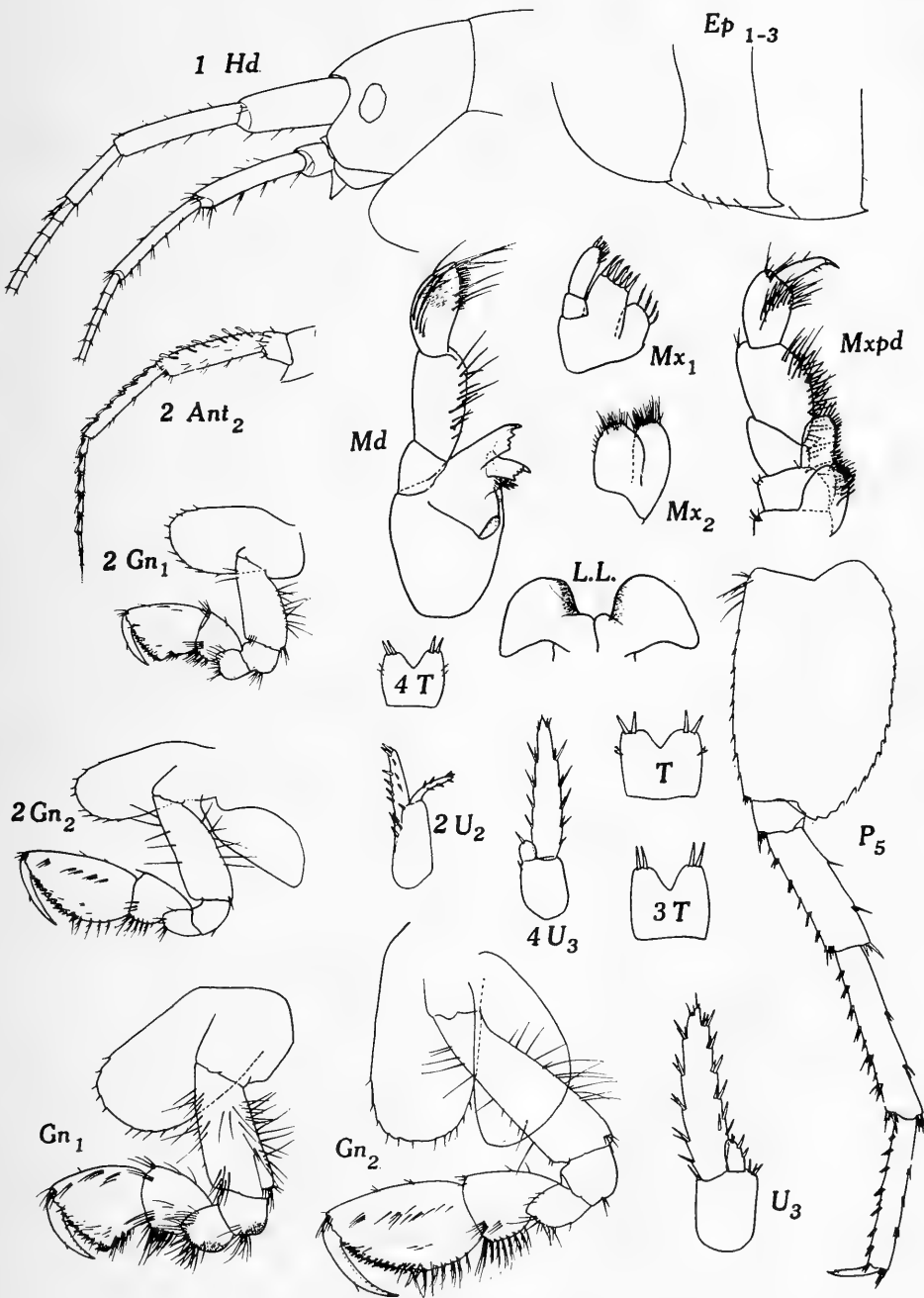


Figure 13. *Crangonyx richmondensis laurentianus* n. subsp. Black L., Gatineau Park, Que. 1. Female 17 mm (TYPE). 2. Male, 11.5 mm (ALLOTYPE). Washtenaw Co., Mich. 3. Female, 16 mm. 4. Male, 11 mm.

marginal setae; outer plate short, narrow, somewhat distally tapering and apically rounded; segment 3 of palp nearly as broad as long.

Propodus of gnathopod 2 tends to be a little broader with fewer posterior and superior lateral setae than in *richmondensis*. In Q.C.I. material, superior lateral setae tend to be irregularly spaced, usually in groups of 2-3, some even single. Brood plates on segments 2-5, anterior three large, margins with long simple setae; hindmost plate small. Peraeopod 5, width of basal segment less than two-thirds its length (in both sexes), posterior margin gently convex, with 10-14 fine serrations. Pleopods normal. Abdominal side plates 2 & 3, lateral corners produced posteriorly as in *richmondensis*. Telson with broad, shallow, apical notch, lobes each with 2 (less often 3) apical spines.

Remarks: The writer has noted the close similarity between topotype material of *C. occidentalis*, kindly supplied by Leslie Hubricht, mature specimens from Newfoundland, and the figures for *C. richmondensis* from S. Carolina given by Ellis (1940). All occur along the shallow margins of small lakes, particularly in somewhat acid waters. However, minor but consistent points of difference were noted which, coupled with their nonoverlapping geographical distributions, provide presently acceptable grounds for subspecific separation of the two populations.

***Crangonyx richmondensis laurentianus* n. subsp.**

Eucrangonyx gracilis Weckel, 1907, p. 32, fig. 3 (large form).

Crangonyx obliquus Hubricht, 1943, p. 689 (*partim*).

Crangonyx occidentalis Bousfield, 1956, p. 141 (*partim*).

Distribution and Ecology: Shallow margins of bog ponds and small, typically acidic lakes and their outflows; from Michigan and south central Ontario to western Quebec. Ovigerous females and mature males from April to June, dying soon after release of young from brood plates.

Material Examined: ONTARIO: Pt. aux Pins, near Sault Ste. Marie, bog pond, C. S. Holling, May 30, 1950 — 8 males, NMC. No. 2201; Black L., Hwy No. 7, just W. of Sharbot L., Frontenac Co., author coll. Ont. Dept. Planning & Development Stream Surveys, 1948, 1950: Moira R. — several stations in the northern (Precambrian Shield) part of the watershed; Napanee R., 2 miles W. of Varty L., and 5 miles E. of Moscow. QUEBEC: author collections from: Black L., Gatineau Pk., near Kingsmere, April 27, 1955 — male, type; female, allotype; 17 adult paratypes. NMC. Nos. 2102, 2103; and Mud Lake, Gatineau Pk., Fortune L., Gatineau Pk., E. L. Mills, June 5, 1957. L. a l'Ours, Mont Tremblant Park, A. Robert, May 24, 1953 — 2 females. NMC. No. 2204. MICHIGAN: Pond on Platt Rd., 0.5 miles N. of Bemis Rd., Washtenaw Co., L. Hubricht, Apr. 30, 1941 (as *C. obliquus*) — 46 adult specimens. NMC. No. 2203.

Diagnosis (Figure 13): Closely similar to the nominate subspecies but typically with only two apical spines on each lobe of the telson (mature animals of both sexes); abdominal side plates 2 & 3, lateral corners moderately produced; body and appendages relatively heavy; size larger at maturity.

Female (14-18 mm): Interantennal lobe of head relatively narrow, corners rounded. Eye small, black, irregularly elliptical. Antenna 1, peduncular segment 2 longest, 3rd shortest; flagellum of 25-35 segments; accessory flagellum minutely 2-segmented, as long as first flagellar segment. Antenna 2, flagellum of 8-10 segments.

Mouthparts tending to reduction of plates and setae. Lower lip, outer lobes bluntly rounded. Mandibular palp, terminal segment about half as broad as long, outer marginal setae staggered, not in groups. Maxilla 1, inner plate with 4 marginal plumose setae. Maxilla 2, plates short and broad, facial row of setae on inner plate virtually obsolete. Maxilliped, inner plate short and broad, armature as in *occidentalis*; outer plate small, bluntly rounded; palp relatively large, segment 2 half again as long as wide, dactyl narrow throughout.

Antero-ventral and postero-ventral corners of coxal plate 1 each with 5-6 short setae. Gnathopod 1, posterior margins of segments 3 & 4 with minute scalelike pectinations; posterior margin of segment 5 with 5-6 clusters of setae; segment 6 (propodus) widest distally, palmar margin gently convex, slightly oblique, armed with numerous cleft spines, posterior angle sharp, defined by several closely crowded spines, posterior margin with about 5 groups of setae; dactyl heavy, inner margin lined with minute setae, closely fitting palm. Gnathopod 2 larger and more powerful; segment 5 with 7-8 posterior groups of setae; segment 6 ovate, palm convex, oblique, multispinose, posterior angle with two stout spines, the larger twice the smaller; tip of dactyl closing between spines at palmar angle; inner face of propodus with about 6-8 irregular groups of superior lateral setae.

Peraeopods 3-5 long and slender, 4th longest, 3rd and 5th subequal; basos of P 5, width about three-fourths its length, convex posterior margin with 15-20 conspicuous serrations; dactyl about one-quarter the length of the propodus. (In brood pouch embryos, peraeopods 4 & 5 are subequal, both larger than peraeopod 3). Brood plates, coxal gills and sternal gills as in *richmondensis*.

Inner ramus of pleopods markedly longer than outer, about $2\frac{1}{2}$ times the peduncle; outer margin of peduncle lined with longish setae (most numerous in pleopod 1), inner margin distally with 3-4 coupling spines. Abdominal side plates, posterior margin shallowly incised distally; lateral corners, moderately produced on 2, weakly acute on 1 & 3. Uropod 3 short, outer ramus about twice the peduncle, lateral margins each with 5-6 groups of spines; inner ramus bearing 2-3 spines on inner distal border. Telson short, cleft nearly one-third to the base, each lobe terminated by 2 spines (3 in immatures and occasionally in adults), laterally with minute paired plumose setae.

Male (9-11 mm): Smaller and more slender than female. Antenna 1, flagellum of about 25 segments. Antenna 2 peduncular segments 4 & 5 and the first five segments of the flagellum with calceoli. Gnathopod 1 much as in female but smaller and less setose. In gnathopod 2, propodus more slender and palm slightly more oblique; dactyl long and thin. Peraeopods 3-5, segments 4-7 relatively longer and more slender. Uropod 2, outer ramus short, curved outwards, a few spines terminally and on lateral margins; no comb spines present. Uropod 3, inner ramus with only one lateral spine.

Remarks: The present race of *richmondensis* has been recorded to date only from the St. Lawrence drainage basin, particularly from small lakes of the Laurentian Shield, hence the specific name. The present description applies closely to the "large form" of *Eucrangonyx gracilis* (Ann Arbor, Michigan) described and figured by Weckel (1907) and correctly stated by Hubricht and Mackin (1940) not to be the true *E. gracilis* Smith. This large Ontario form was first specifically recognized (by the writer, 1956) under the name *C. occidentalis* H. & H., but from which it is now considered subspecifically distinct. The listed material from Washtenaw Co., Mich., identified by Hubricht (1943) as *Crangonyx obliquus* (H. & H.), is very like Weckel's Ann Arbor specimens in the shape and armature of segments 5-7 of gnathopods 1 & 2, and in the telson, but quite unlike the corresponding figures of Hubricht and Mackin for *C. obliquus*.

Crangonyx shoemakeri (Hubricht & Mackin)

Eucrangonyx shoemakeri Hubricht & Makin, 1940, p. 198, fig. 6 (*partim*).

Crangonyx shoemakeri Hubricht, 1943, p. 690 (*partim?*); Cole, 1957, p. 36, fig. 2F (?).

Distribution and Ecology: Known authentically only from temporary pools, ponds, and springs near Georgetown, D.C. (type locality); probably in similar habitats of American Atlantic coastal drainage basins.

Remarks: Hubricht and Mackin (1940, p. 198) note that the row of comb spines on the outer ramus of the second uropods is present in males from the District of Columbia but not from Illinois or Oklahoma. In the writer's

experience with the genus *Crangonyx*, the armature of the second uropods in the male was found to be specifically diagnostic; accordingly the material from Illinois and Oklahoma represents a species distinct from *C. shoemakeri*, the identity of which awaits more complete description of both it and the type of *C. shoemakeri*. Hubricht (1943) gives numerous locality records for "*C. shoemakeri*" from Michigan, Ohio, Indiana, Illinois, Kentucky, and Missouri, but none from the Atlantic coastal plain, nor does he indicate which of his material bears comb spines and which does not. Specimens from a spring stream in Kentucky provided for this study by Leslie Hubricht do not have the comb spines and, as elsewhere noted (p. 61), are closely similar to Ontario specimens of *C. setodactylus*. The probability is great, therefore, that many of Hubricht's records, particularly from permanent bodies of water, are not referable to *C. shoemakeri* (H. & M.).

***Crangonyx setodactylus* n. sp.**

EuCrangonyx shoemakeri Hubricht & Makin, 1940, p. 198 (*partim*), non fig. 6g.

Crangonyx shoemakeri Hubricht, 1943, p. 690, (*partim*); Cole, 1957, p. 36, (*partim?*).

Distribution and Ecology: Recorded only from three streams in southwestern Ontario and a spring stream in Fayette Co., Kentucky; probably widely occurring in streams, drains, and ditches of the southern part of the St. Lawrence and northern regions of the Mississippi and Ohio drainage systems. Ovigerous females April to June; adults die soon after release of young from brood pouch.

Material Examined: ONTARIO: Spitler Creek (P. & D. Sta. Y2b4), 4 miles west of Norwich, Oxford Co., E.L.B., May 29, 1957 — Male, type; female, allotype; 3 ovig. female paratypes. NMC. Nos. 2104, 2105; Stony Creek (P. & D. Sta. Y3t1), 4 miles W. of Tillsonburg, Oxford Co., E.L.B., May 29, 1957 — 2 males, 14 females, NMC. No. 2197; Same station, P. & D. stream survey, June, 1955 — 1 female (17 mm). NMC. No. 2196; Nith R., tributary near Amulree, 10 miles N.E. Stratford, Perth Co., E.L.B., May 29, 1957 — 2 ovig. females, NMC. No. 2198. KENTUCKY: Spring near Bryan Sta., 0.3 miles E. of Eastern Road, N.E. of Lexington, Fayette Co., L. Hubricht, April 25, 1941 — 24 males, 28 ovig. females. NMC. No. 2199.

Diagnosis (Figure 14): A rather large species of the *shoemakeri* group having strongly toothed palmar and dactylar margins in the gnathopods in the female but distinguished by characters given in the key (p. 6).

Female (10.5-17 mm): Eyes rather small, subrotund, black. Antenna 1, flagellum of 22-28 segments; accessory flagellum shorter than 1st flagellar segment. Antenna 2, combined lengths of subequal peduncular segments 4 & 5 less than peduncle of antenna 1, flagellum of 10-11 segments.

Lower lip, inner lobes weak. Mandibular palp, outer margin of segment 3 with 2 proximal and 1 distal groups of setae. Maxilla 1, inner plate with about 8 marginal setae. Maxilla 2, inner plate with oblique facial row of 8-9 setae; outer plate rather narrow. Maxilliped, inner plate with 3-4 terminal spine teeth and 4-5 inner marginal plumose setae; outer plate blunt-rounded, lateral margins parallel; palp rather slender.

Coxal plate 1, lower margin with about 12 short setae. Gnathopod 1, segment 5 with small free posterior margin bearing 2 groups of long setae; segment 6 (propodus) subquadrate, palmar margin slightly concave, bearing 12-15 cleft spines on each side and about 6 groups of long setae on posterior margin; posterior angle with one large and two small spines on outer side, 5 small spines on inner; dactyl stout, moderately curved. Gnathopod 2 similar but larger; segment 6 subrectangular, palmar margin more oblique, straight or very slightly convex, posterior angle with 2 small spines behind large spine on outer side, and 3 corres-

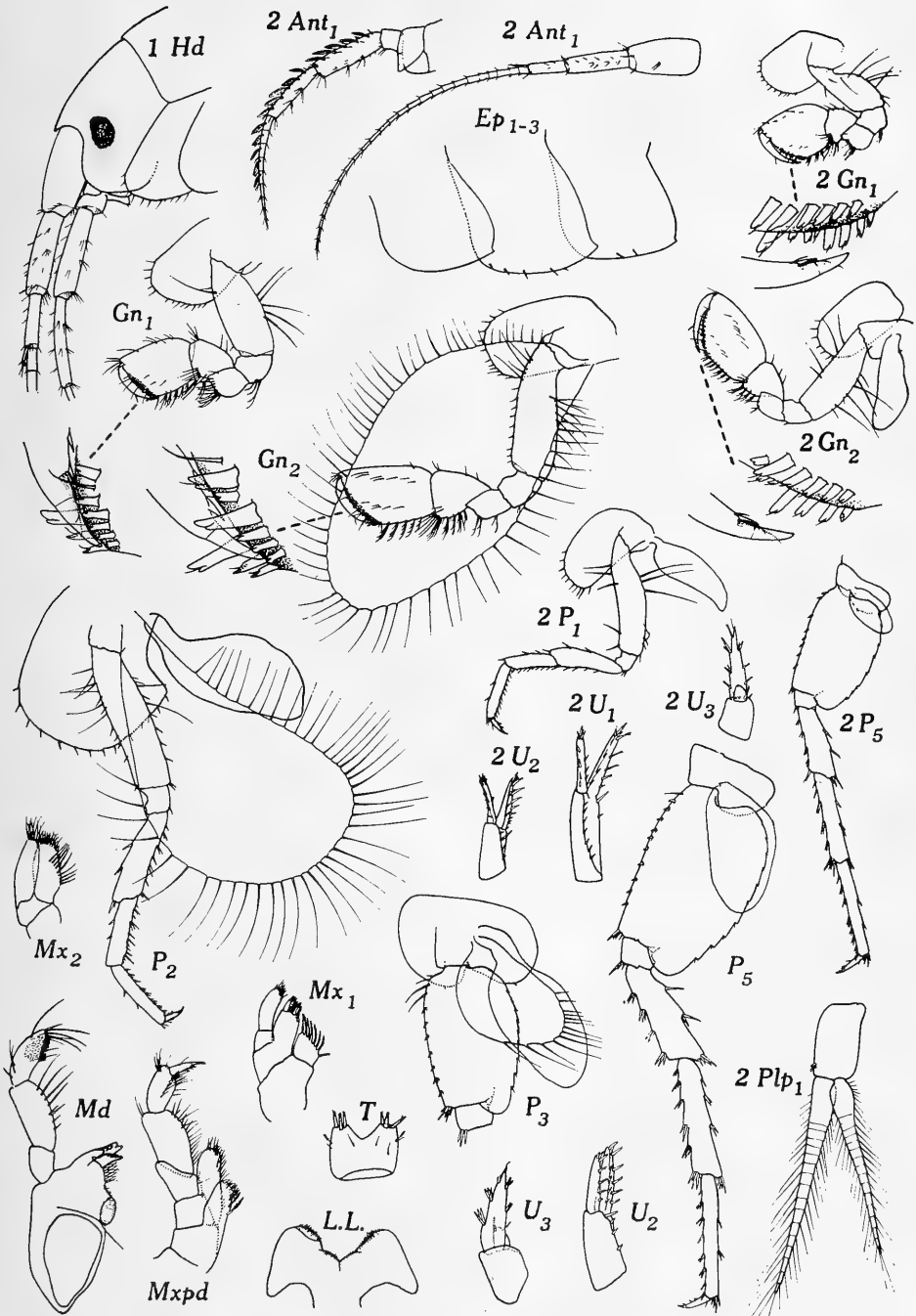


Figure 14. *Crangonyx setodactylus* n. sp. Spitler Creek, Oxford Co., Ontario. 1. Female, 13.5 mm (TYPE). 2. Male, 8.5 mm (ALLOTYPE).

ponding small spines on inner side; superior lateral setae singly or doubly inserted. Brood plate large, oval, equal in length to gnathopod 2.

Peraeopod 2, coxal plate about as wide as deep, postero-ventral margin setose. Peraeopod 3, brood plate very short and broad. Peraeopod 5, basal segment half again as long as broad, posterior margin with about 10 weak serrations. Dactyls of all peraeopods usually with 2-3 short bristles on inner margin. Coxal gills of moderate size. Paired sternal gills on segment 6, two pairs on 7.

Pleopods, inner ramus distinctly longer than outer, about 3 times the peduncle. Abdominal side plates 1-3, lateral corners minutely acute and not prominently produced, lower margins of 2 & 3 with a few spines. Uropod 2 short and stout, outer ramus a little shorter than inner; uropod 3, outer ramus barely longer than peduncle, inner ramus with 1-2 spines distally. Telson broader than long, shallowly cleft; lobes each with 3 terminal spines.

Male (8.5 mm): Smaller and more slender than female. Antenna 1, flagellum of 24 segments. Antenna 2, flagellum of 9 segments; anterior margins of peduncular segments 4 & 5 each with 5 calceoli. Gnathopod 1, palmar margin of propodus convex, oblique, posterior angle with 4 spines on outer and inner margins; tip of slender dactyl reaching almost to most posterior spines of palmar margin. Gnathopod 2, propodus more elongate; inner face with about 5 singly or doubly inserted superior lateral setae. Uropod 2, inner margin of outer ramus with 1 and outer margin with 4 short spines. Uropod 3, outer ramus slender, longer than peduncle; inner ramus unarmed.

Remarks: The presence of 2-3 small stiff setae on the inner margin of the dactyls of the peraeopods is a prominent diagnostic character, hence the specific name *setodactylus*.

***Crangonyx minor* n. sp.**

Eucrangonyx gracilis Hubricht & Mackin, 1940, p. 199 (*partim*).

? *Crangonyx gracilis gracilis* Hubricht, 1943, p. 691 (*partim*).

Distribution and Ecology: Recorded from hard-water streams, ditches, drains, and sloughs of southwestern Ontario and Missouri, but probably widely occurring in the east-central United States. Oviparous females April to June.

Material Examined: ONTARIO: Stony Creek, 4 miles W. of Tillsonburg, Oxford Co., (P. & D. Sta. Y3t1), E.L.B., May 29, 1957 — Male, type; female, allo-type; 5 male and 14 ovig. female paratypes. NMC. Nos. 2101, 2133; same station P. & D. stream survey, summer, 1955 — 1 ovig. female; also E.L.B., Aug. 30, 1956 — several immatures; Spitler Creek (P. & D. Sta. Y2b4), 3 miles N.W. of Springfield, Oxford Co.; Horner Creek (P. & D. Sta. S1b2), 4 miles E. of Shakespeare, Oxford Co.; Nith River (P. & D. Sta. L1m1), Perth Co. MISSOURI: Slough near Mississippi R., 1 mile from Grimsby, St. Louis Co., L. Hubricht, April 25, 1938 — 3 males, 1 ovig. female. NMC. No. 2136.

Diagnosis (Figure 15): A small species of the *shoemakeri* group, distinguished by the blunt, recessed lateral corners of the abdominal side plates, the slender, finely setose terminal segment of the mandibular palp, and the heavily spinose anterior margin of the basal segment of peraeopod 5 in the female.

Female (6.5-9.0 mm): Eyes moderate, deeper than wide, black, close to anterior margin of head. Antenna 1, peduncular segments successively decreasing in size distally; flagellum of 19-20 segments. Antenna 2, peduncular segments 4 & 5 slender, subequal; flagellum of 8-9 segments.

Lower lip rather deep, outer lobes distally acute; inner lobes weak. Mandibular palp, terminal segment minutely setose distally, outer margin with 2 longish setae proximally. Maxilla 1, inner plate with 6-7 marginal plumose setae. Maxilla 2, inner plate with oblique facial row of 6 plumose setae. Maxilliped inner plate with 4-5 apical spine teeth and 3-4 plumose marginal setae; outer plate blunt-rounded; palp slender, nail of dactyl long.

Gnathopod 1, coxal plate lined below with 14-15 setae; propodus subquadrate, palmar margin distinctly concave, slightly oblique, armed with 16-20 spines on each side; posterior angle with 4 short spines on outer margin and 6 on inner; posterior margin with about 3

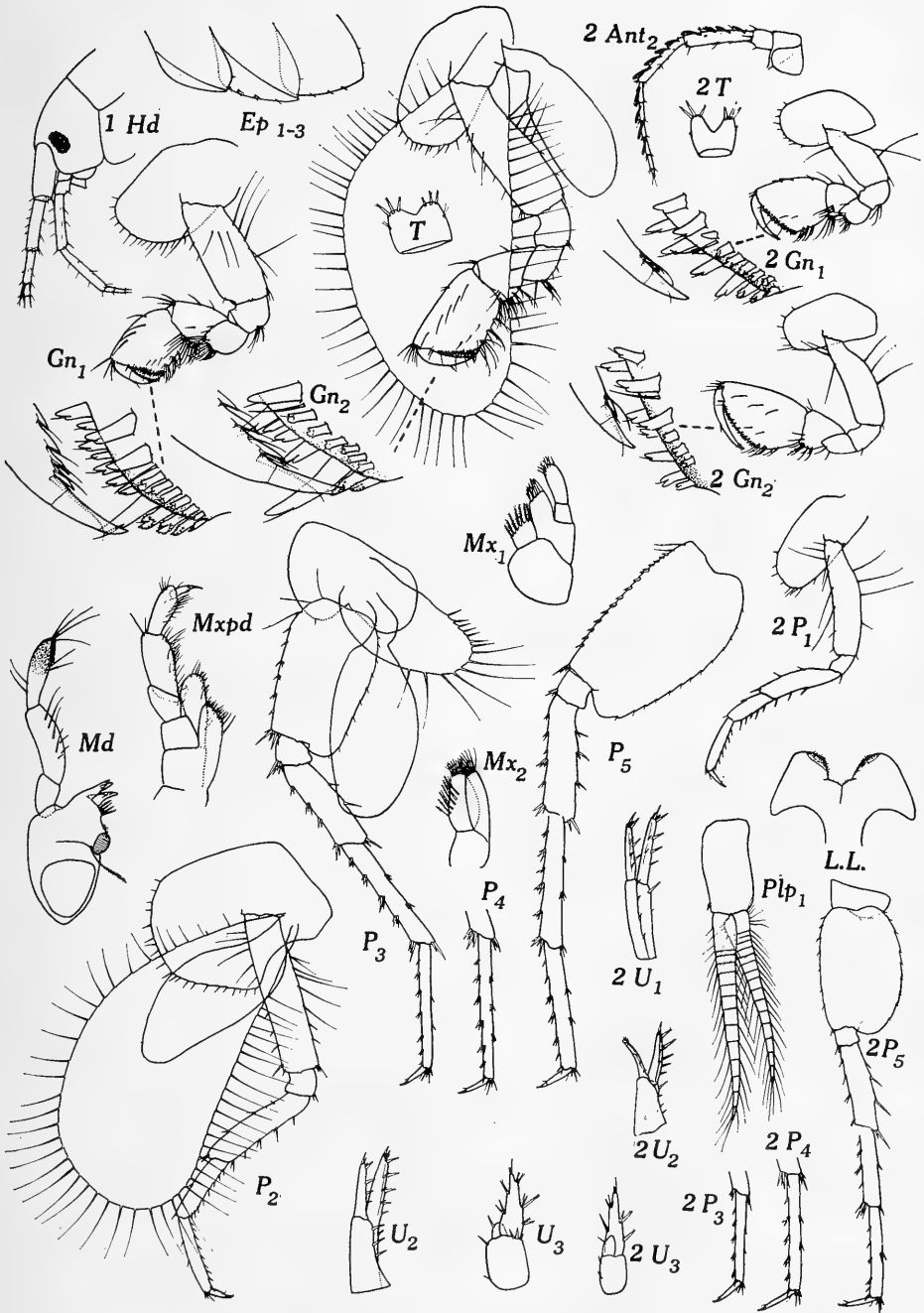


Figure 15. *Crangoynx minor* n. sp. Stony Creek, Oxford Co., Ontario. 1. Female, 8.5 mm (TYPE). 2. Male, 5.0 mm (ALLOTYPE).

groups of setae; dactyl strongly toothed on inner margin, tip reaching posterior angle. Gnathopod 2 generally similar but stronger; propodus subrectangular, palmar margin slightly concave, more oblique; posterior angle with 1 long and 2 short spines on outer side and 6 short spines on inner side; superior lateral setae singly inserted. Brood plate expanded anteriorly, about as long as gnathopod 2.

Peraeopod 2 slender, postero-ventral margin of coxal plate lined with about 20 setae; brood plate broad distally, narrowing proximally. Peraeopod 3, brood plate about twice as long as wide. Peraeopod 5, basal segment relatively narrow, anterior margin with about 15 short spines, posterior margin with 10-13 minute serrations. Dactyls of peraeopods less than one-third the length of the propods, inner margins with only one small seta at base of nail. Coxal gills rather large and long. Paired sternal gills on segment 6, two pairs on 7, the last rather long and lanceolate. Sternal process prominent on segment 2.

Inner ramus of pleopods longer than outer and barely more than twice the peduncle. Abdominal side plates posteriorly recurved or truncate, not acutely produced; lower margins with a few spines. Uropod 3, outer ramus short and broad at base, barely exceeding peduncle in length; inner ramus small, one spine apically. Telson broader than long, shallowly cleft; lobes each with 3 apical spines.

Male (5.0 mm): Antenna 1, flagellum with 16-17 segments. Antenna 2, flagellum of 6-7 segments. Gnathopod 1 relatively more powerful than in female; propodus distally broadest, palmar margin more oblique and nearly straight; nail of dactyl short, not reaching posterior angle. Gnathopod 2 broadening distally, palmar margin oblique, convex, superior lateral setae (3 only) single inserted. Peraeopods more slender and dactyls relatively longer than in female. Uropod 2, outer ramus with 3 spines along outer margin, inner margin unarmed, apex with a group of short spines. Uropod 3, outer ramus more slender and half again as long as peduncle. Telson cleft half way to base.

Remarks: The species is closely related to *C. shoemakeri* and *C. setodactylus* but is much smaller, hence the specific name *minor*.

***Crangonyx rivularis* n. sp.**

Eucrangonyx gracilis Hubricht & Makin, 1940, p. 199 (*partim*).

Crangonyx gracilis gracilis Hubricht, 1943, p. 691 (*partim*).

Distribution and Ecology: Recorded from streams, drains, ditches, and small ponds in limestone regions of southern and eastern Ontario; probably throughout the southern part of the St. Lawrence and Ohio river systems. Frequently in small headwater streams and springs that are cool to cold in summer. Oviparous females from April to June, dying shortly after release of young.

Material Examined: ONTARIO: Rocky Saugeen R. (P. & D. Sta. 2cl'), small tributary 4 miles N. of Durham, Grey Co., E.L.B., May 30, 1957 — Male, type; female, allotype; 7 male, 18 ovig. female paratypes. NMC. Nos. 2108, 2109. Also from the following watersheds (Ont. Dept. Planning & Development & author collections): Saugeen; Thames; Horner; Little Otter; Stony; Spitley; Venison (Big trib.); Credit (Orangeville); Drilled well, 85 ft., McCarthy Rd., Uplands (south of Ottawa), E.L.B., Feb. 13, 1957 — 2 immature males, 3 immature females.

Diagnosis (Figure 16): A small species of the *gracilis* group having weakly spinous palmar margins of the propods of the gnathopods in the female but distinguished by the nearly truncate, weakly acuminate lateral corners of the abdominal side plates, the weakly serrated posterior margin of the basos of peraeopods 3-5, the presence of grouped (rather than singly inserted) setae on the posterior margin of the propodus of gnathopod 1 in both sexes, the relatively numerous small cleft spines at the posterior angles of the propods of the gnathopods, and the numerous short, stout, widely spaced spines on the outer ramus of uropod 2 in the male.

Female (5.5-7.0 mm): Eyes oblong, black, anterior. Antenna 1, flagellum of 19-20 segments; accessory flagellum longer than first joint of primary flagellum. Antenna 2, peduncular segment 4 slightly longer than 5; flagellum of 8-9 segments.

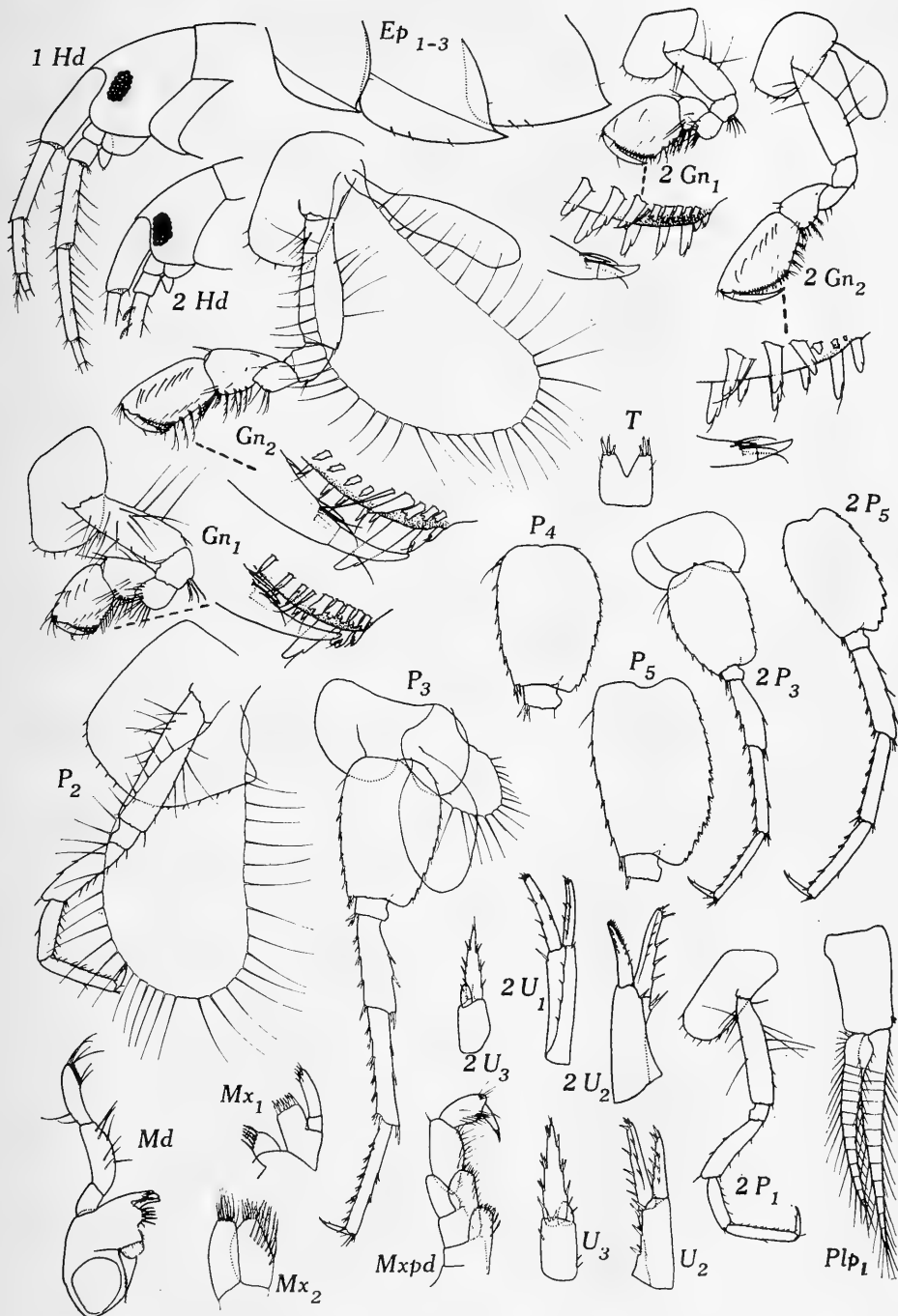


Figure 16. *Crangonyx rivularis* n. sp. Rocky Saugeen R., Station 2cl', Grey Co., Ontario. 1. Female, 6.0 mm (TYPE). 2. Male, 4.5 mm (ALLOTYPE). Rocky Saugeen Station 3G2e, northwest of Durham, Ontario. 3. Female, 6.5 mm.

Lower lip, outer lobes rather deep; inner lobes weak. Mandibular palp relatively short, 3rd joint finely setose distally, outer margin proximally with one long seta. Maxilla 1, inner plate with four marginal plumose setae; palp short. Maxilla 2, inner plate with oblique facial row of 5 plumose setae. Maxilliped, inner plate with 3 apical spine teeth and 3-4 plumose marginal setae; outer plate short, blunt.

Coxal plate 1, lower margin with about 8 setae. Gnathopod 1, segment 6 subquadrate, palmar margin slightly convex, nearly perpendicular, bearing a few weak spines on each side, posterior angle with large spine and 2-3 smaller spines on outer side, 4-5 small inner spines; dactyl, inner margin with several setae, nail long. Gnathopod 2 similar but longer, propodus subrectangular, palmar margin more oblique, posterior angle with one large and 2-3 small spines on outer side, one large and 3-4 small spines on inner side; superior lateral setae singly inserted.

Peraeopod 2, coxal plate with about 16 marginal setae. Peraeopod 3, brood plate short, broad. Peraeopod 5, basos half again as long as broad, anterior margin with about 8 spines, posterior margin with 10 weak serrations; dactyls of peraeopods 3-5 about 35-40% as long as respective segment 6. Paired sternal gills on segment 6, two pairs on 7. Sternal process on thoracic segment 2.

Inner ramus of pleopods the longer, about twice the peduncle. Abdominal side plates, lateral corners quadrate or recurved, weakly acuminate, not produced posteriorly; a few short spines along lower margins. Uropod 3, outer ramus broadly tapering, nearly twice the peduncle; inner ramus small, one marginal spine. Telson as broad as long, shallowly cleft; lobes each with 2-3 long apical spines.

Male (3.5-4.5 mm): Very small and slender. Antenna 1, flagellum of 15-16 segments. Antenna 2, flagellum of 6 segments. Gnathopod 1 relatively larger and more powerful; palmar margin of propodus more oblique, armed throughout with strong spines; setae of posterior margin inserted singly or in groups; dactyl without setae along inner margin except at base of nail, tip barely reaching spine group at posterior angle. Gnathopod 2, propodus distally widening, palmar margin oblique, convex, lined throughout with strong spine teeth. Uropod 2, outer ramus nearly straight, apex and distal margins lined with well-spaced short spines. Telson cleft one-fourth to the base.

Remarks: This species appears to be the dominant form of small streams and springs in hard-water regions, hence the specific name *rivularis*. In slightly larger females from P. & D. station 3g2e, Rocky Saugeen R., the small spines at the posterior angles of the propods of the gnathopods are more numerous, and the setae on the posterior margins are usually in groups of 3-4. Lobes of telson each frequently with only 2 apical spines.

***Crangonyx pseudogracilis* n. sp.**

? *Crangonyx gracilis* Forbes, 1876, p. 6 (*partim*), Hynes, 1955.

? *Melita parvimana* Holmes, 1904, p. 506, fig.

Eucrangonyx gracilis Kunkel, 1918, p. 94, fig. 20 (*partim*); Johansen, 1920, p. 128 (*partim*); Hubricht & Mackin, 1940, p. 199, fig. 7 (*partim*).

Crangonyx gracilis gracilis Hubricht, 1943, p. 691 (*partim*).

Distribution and Ecology: Recorded from rivers, river mouths, lakes, sloughs, quarry ponds, dams, and other larger fresh waters that tend to be somewhat turbid and warm in summer; from southern Ontario, southwestern Quebec, and Vermont to Missouri; probably throughout the Mississippi drainage basin, lower part of the St. Lawrence system, and American Atlantic watersheds. The writer has seen no material from springs, spring streams, or waters that are typically cold and clear in summer. Adults breed in spring and throughout the summer. Frequently taken in company with *Gammarus fasciatus* and *Hyaella azteca*, though less often with *C. gracilis* and *G. pseudolimnaeus* (in northern areas); also taken with *C. minor* and an undescribed species in Missouri. Introduced in the British Isles.

Material Examined: ONTARIO: Napanee R., at Napanee (P. & D. sta. P1a20), Lennox & Addington Co., June 9, 1950 — Male, type; female, allotype; 3 ovig. female paratypes. NMC. Nos. 2107; South Nation R., at Hwy. 17, Prescott Co., E. Mills, June 9, 1957 — 1 male. NMC. No. 2190; also author collections from Champlain Bridge, Ottawa R.; Rideau R., below Hog's Back, Ottawa; and L. Huron, mouth of Thessalon R. Additional specimens, Ont. Dept. Planning & Development, at: Nith R., at New Dundee, Waterloo Co.; Humber R. near Toronto; South Nation R., Prescott Co. QUEBEC: Fairy L., near Hull, author coll.; Ile Perrot, quarry pond, J. S. Bleakney, May 28, 1955 — 2 males, 2 ovig. females. NMC. No. 2194; same locality, C. Durden, April 21, 1957 — 3 males. NMC. No. 2195; Ruisseau, Ile Bizzard Co., P. Brunel, coll. VERMONT: L. Champlain, Burlington Whf., author coll. MISSOURI: Slough near Mississippi R., 1 mile S. of Grimsby, St. Louis Co., L. Hubricht, April 25, 1938 — 15 males, 14 ovig. females. NMC. No. 2128. WISCONSIN: Ashland, mouth of Fish Creek, auth. coll. 1957.

Diagnosis (Figure 17): Superficially much like *C. gracilis* Smith in type of gnathopods, peraeopods, and abdominal side plates, but distinguished by the larger eyes, more setose peduncle of antenna 2, shorter peraeopod dactyls, presence of comb spines on the outer ramus of uropod in the male, and presence of two small accessory spines in the outer row at posterior angle of propodus of gnathopod 2 in the female.

Female (7.5-10.5 mm): Eyes relatively large, oblong, black, anterior. Antenna 1, peduncular segments 1 & 2 subequal, 3rd much shorter; flagellum of 21-23 segments; accessory flagellum longer than 1st flagellar segment. Antenna 2, peduncular segments 4 & 5 subequal, slender, setose; posterior margin of 4 with 2-3 groups and of 5 with 4-5 groups of long setae; flagellum of 8 segments.

Mandibular palp slender; outer margin of terminal segment proximally with 2 long setae. Maxilla 1, inner plate with 5 marginal plumose setae; palp long. Maxilla 2, inner plate short, broadest in middle, oblique facial row of 7 plumose setae. Maxilliped, inner plate short, 4 spine teeth on rounded apex, inner margin with 3-4 plumose setae; palp strong, segment 2 broad.

Coxal plate 1, lower margin with about 8 setae. Gnathopod 1; propodus subquadrate, palmar margin convex, oblique, lined with weak spines, posterior angle with one large and two small spines on outer side and five small spines on inner side, posterior margin with about 6 singly (occasionally doubly) inserted setae; dactyl strong, inner margin with a few weak setae, nail long, tip closing almost on most posterior spines of palmar margin. Gnathopod 2 larger; propodus subrectangular, palmar margin convex, oblique, lined on either side with weak spines, posterior angle with one large and two small spines on outer side, and one large and three (or four) small spines on inner side, posterior margin with groups of long setae, 7-8 superior lateral setae singly or occasionally doubly inserted.

Peraeopod 2, coxal plate about as wide as deep, postero-ventral margin with about 13 short setae; segment 2 extending beyond ventral margin of coxal plate by nearly one-fourth its length. Peraeopod 3, basal segment with 11 weak posterior serrations; brood plate short, broad. Peraeopod 5, basos with about 16 irregularly spaced, distally pronounced, serrations. Dactyls of peraeopods 3-5 about one-third the length of corresponding propods. Coxal and sternal gills not unusual in size or shape.

Inner ramus of pleopods 25% longer than outer and about twice the peduncle. Abdominal side plates, lateral corners acute, that of 2 strongly produced posteriorly, lower margin long, armed with a few short spines. Uropod 3, outer ramus half again as long as peduncle, regularly tapering; inner ramus with one or two marginal spines. Telson longer than wide, cleft one-third to the base.

Male (4.5-5.5 mm): Eyes large, irregularly oblong, black. Antenna 1, flagellum of 19-20 segments. Antenna 2, flagellum of 6 segments. Gnathopod 1 relatively more powerful, palmar margin of propodus longer and more oblique than in female, lined on both sides with strong spines; dactyl short, nail very short, tip barely closing on spines at posterior angle. Gnathopod 2, propodus distally widest, palmar margin oblique, convex, spines numerous and strong; dactyl and nail short. Peraeopods 3-5 more slender, and posterior

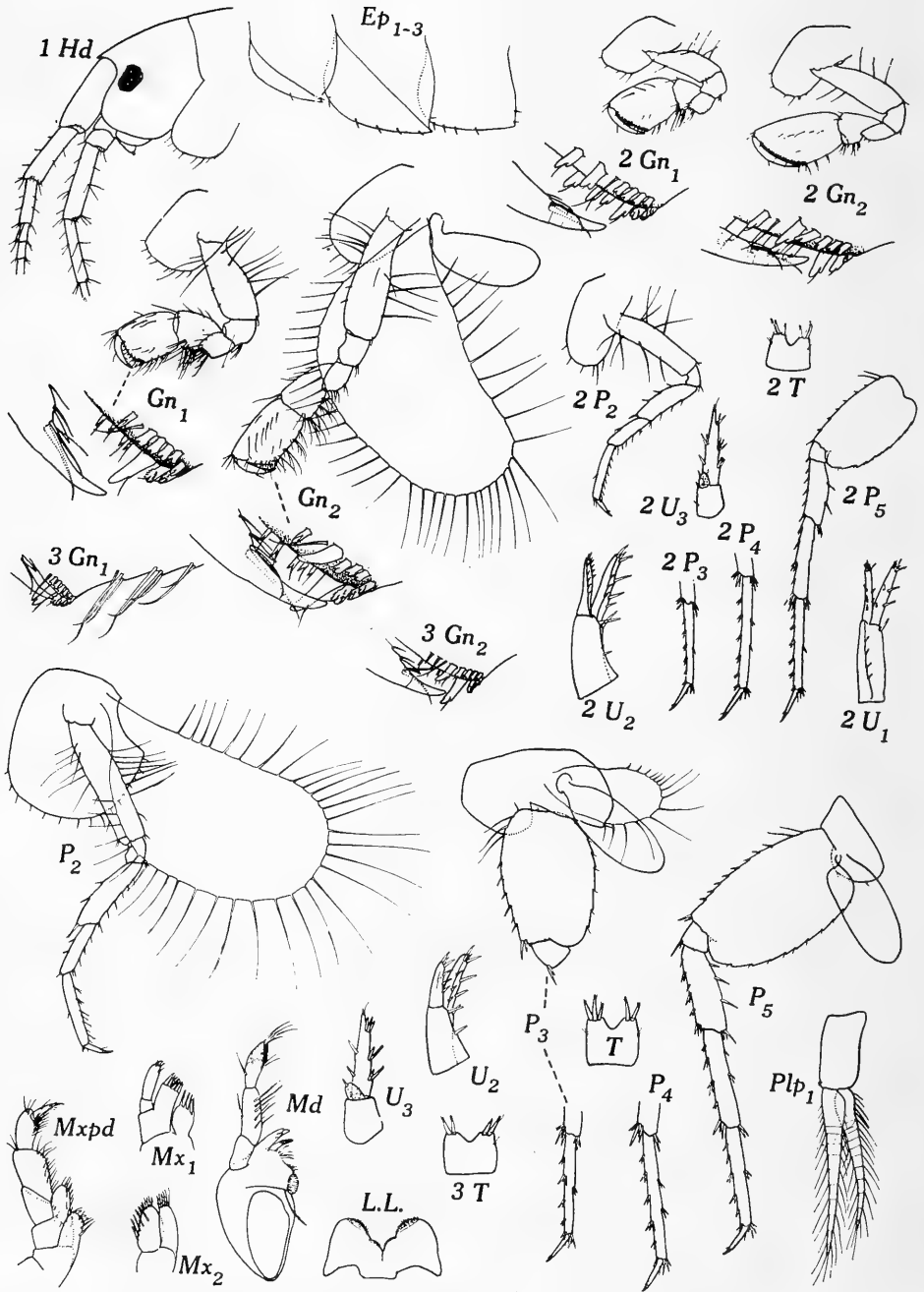


Figure 17. *Crangonyx pseudogracilis* n. sp. Napanee R., Napanee, Ontario. 1. Female, 8.0 mm (TYPE). 2. Male, 5.0 mm (ALLOTYPE).

margin of basal segment of 5 with fewer serrations than in female; dactyls about two-fifths the length of respective propods. Uropod 2, outer ramus curved slightly outwards, inner margin lined distally with about 10 closely set comb spines. Uropod 3, inner ramus without marginal spines. Telson cleft nearly half way to base, lobes each with 3 apical spines.

Remarks: This species has been previously confused with the superficially similar *C. gracilis* Smith, hence the specific name. Holme's "*Melita parvimana*" (1904) is unquestionably a *Crangonyx* and very probably *pseudogracilis*. The ecological notes and localities of Forbes (1876), Kunkel (1918), and Johansen (1920) suggest that some of their material was also referable to this species. A lot of 50 specimens from Grimsby, Missouri, from which the figures of "*Eucrangonyx gracilis*" Hubricht & Mackin (1940) were prepared, was found to contain three species, none referable to Smith's species. One of the three species (having comb spines on uropod 2 in the male) the writer is unable to distinguish from Ontario specimens of *C. pseudogracilis* and is listed above. Specimens from the Severn Thames canal, Gloucestershire, England, kindly supplied by Dr. C. Edwards, have comb spines on uropod 2 in the male and appear to be *C. pseudogracilis*.

Crangonyx gracilis Smith

Crangonyx gracilis S. I. Smith, 1871, p. 453; 1874, p. 654 (*partim*); S. A. Forbes, 1876, p. 6 (*partim*); ? Cole 1957, p. 36.

Eucrangonyx gracilis Weckel, 1907, p. 32, fig. 3 (small form); Huntsman, 1915, p. 152 (*partim*), non fig. 4c; Johansen, 1920, p. 128 (*partim*); Hubricht & Mackin, 1940, p. 199 (*partim*) non fig. 7.

? *Crangonyx gracilis gracilis* Hubricht, 1943, p. 691 (*partim*).

Distribution and Ecology: Recorded authentically from L. Superior, L. Huron, L. Michigan, L. Ontario, and the Muskoka Lakes; from permanent ponds, pools, streams and swamps that are cool to cold in summer, in Ontario and the Great Lakes drainage basin.

Material Examined: ONTARIO: L. Superior, St. Ignace I., S. I. Smith, summer, 1871. 1 male, 1 ovig. female topotypes; author coll. from L. Huron, mouth of Thessalon R.; Beattie Pt., Carleton Co., swamp pool and temporary stream; Quarry pond, Carlingwood Heights, Ottawa; Moira R., small bay 4 miles W. of Kaladar beside Hwy. No. 7; Small pond W. of Metcalfe, Russell Co., W. Sinclair, May, 1957 — several males and numerous ovigerous females. Additional material from the following watersheds (P. & D. collections): Big Creek; Little Otter Creek; Spitler Creek; Stony Creek; Moira. QUEBEC: author coll. from: Black L., Pinks L., Gatineau Park, above Hull; Ile Perrot, quarry pond, J. S. Bleakney, May 28, 1955 — 1 male, 2 ovig. females; same locality, spring stream, C. Durden, April 21, 1957 — 8 males.

Diagnosis (Figures 18, 19): The original description of Smith (1871, 1874) is detailed but not altogether accurate and lacks figures, thus contributing in some measure to subsequent confusion between this and similarly sized species from elsewhere on the N. American continent. Through the kindness of C. R. Shoemaker, topotype male and ovigerous female specimens, collected by Smith in L. Superior, have been made available to the writer and are herewith redescribed. The figure of the male second uropod (Figure 19) was drawn by Mr. Shoemaker from another topotype specimen.

Female (6.0-10.5 mm): Eyes irregularly subovate, black, close to anterior margin of head. Antenna 1, peduncular segments 1 & 2 subequal, 3rd much shorter; flagellum of 22-23 segments; accessory flagellum with relatively prominent second joint, about equal to first segment of primary flagellum. Antenna 2, peduncular segments 4 & 5 subequal, posterior margin of 4 with only 1 distal group of long setae and 1 or 2 groups of short setae proximally.

Lower lip rather broad and shallow. Mandibular palp short, segment 2 broad; segment

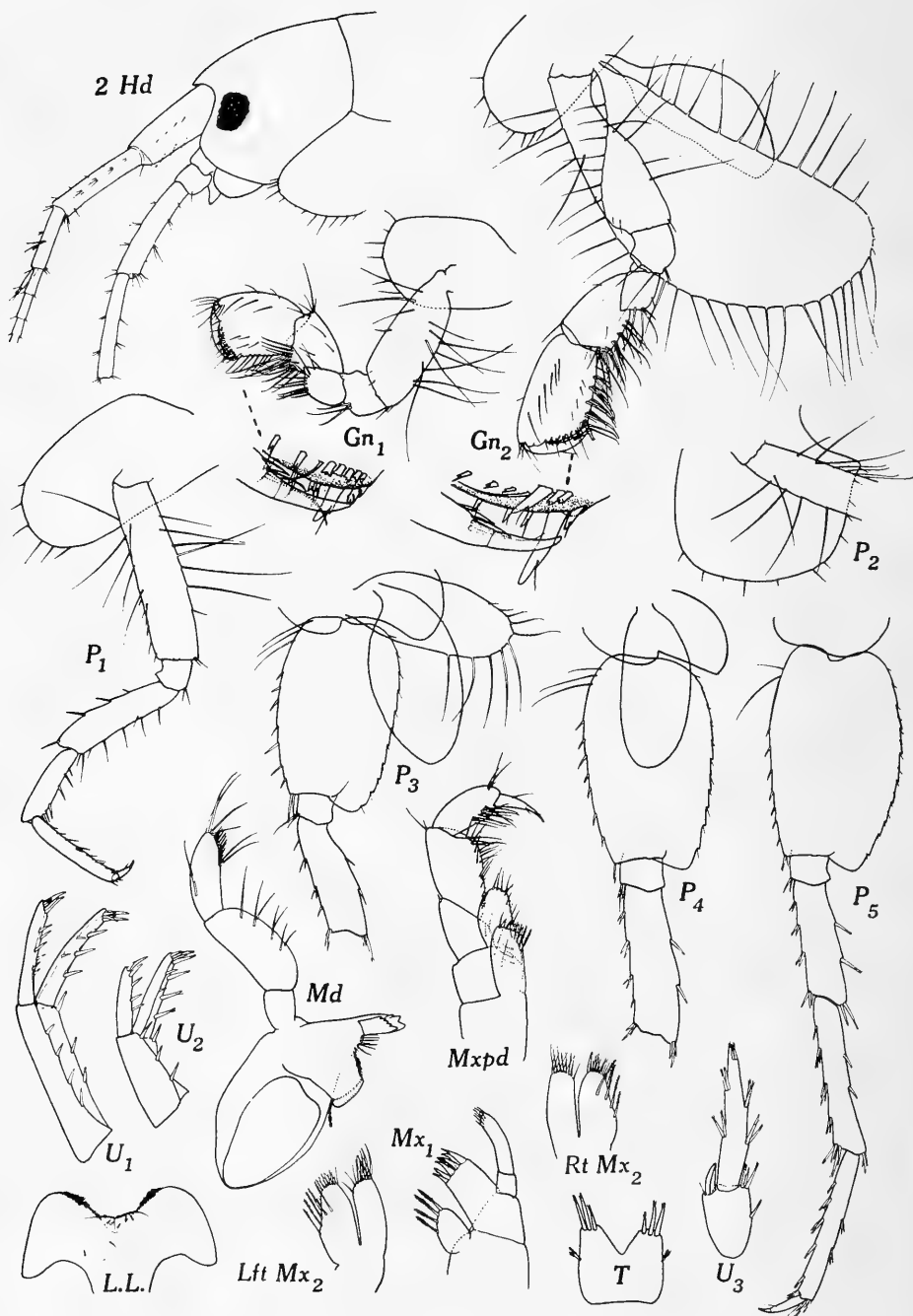


Figure 18. *Crangonyx gracilis* Smith L. Superior, off St. Ignace I. 1. Female, 6.0 mm (TOPOTYPE). Pond at Beattie Point, west of Ottawa, Ontario. 2. Female, 10.5 mm.

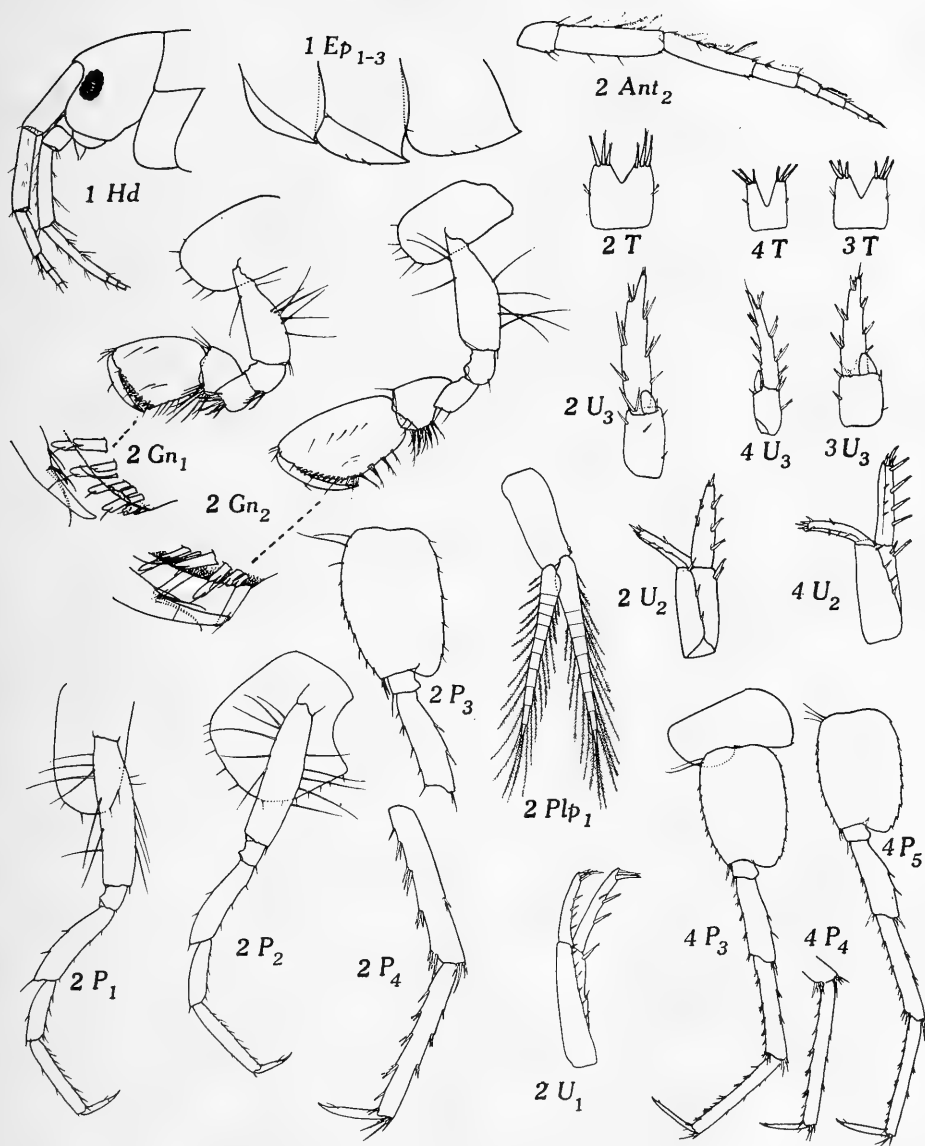


Figure 19. *Crangonyx gracilis* Smith. L. Superior, off St. Ignace I. 1. Female, 6.0 mm (TOPOTYPE). 2. Male, 4.0 mm (TOPOTYPE). Pond at Beattie Point, west of Ottawa, Ontario. 3. Female, 10.5 mm. 4. Male, 6.5 mm.

3 with one long seta proximally on inner margin. Maxilla 1, inner plate with 4 plumose setae; palp rather long. Maxilla 2, inner plate with oblique facial row of 5 plumose setae. Maxilliped, inner plate long, with 4-5 apical spine teeth and 3-4 marginal plumose setae; palp rather stout, 2nd and 3rd segments subequal.

Gnathopod 1, lower margin of coxal plate with 6-7 longish setae; propodus subquadrate, palmar margin convex, nearly perpendicular, lined on both sides with weak spines, posterior angle with one large and two small spines on outer side, and five small spines on inner side, posterior margin with 6-8 singly (occasionally doubly) inserted setae; dactyl strong, a few weak setae on inner margin, nail long, tip closing on posterior angle. Gnathopod 2 somewhat larger and more powerful; propod somewhat wider distally, palmar margins more oblique, convex, posterior angle with one long and one short spine on outer side, and one long and 2-3 (occasionally 4) short spines on inner side; superior lateral setae singly inserted.

Peraeopod 2, segment 2 not much exceeding lower margin of coxal plate. Peraeopod 3, basal segment with 6-7 prominent spines on anterior margin and 10-12 weak serrations on gently convex posterior margin; brood plate relatively long and narrow, with few marginal setae. Peraeopod 5, basos half again as long as wide, posterior margin convex, with 10 or more serrations that are not as deep as the contained setae. Dactyls of peraeopods 3-5 about one-third the respective propods. Sternal gill on abdominal segment 1 smallest, drop-shaped.

Inner ramus of pleopods a little longer than the outer, less than twice the peduncle. Abdominal side plates, lateral corners acute, that of 2 rather strongly produced; lower margin rather short, with a few spines. Uropod 2, inner ramus equal to peduncle. Uropod 3, outer ramus about twice the peduncle, 2-3 groups of spines on lateral margins; inner ramus bare. Telson about as wide as long, cleft one-third to base, lobes each with 3 long apical spines.

Male (4.5 mm): Antenna 1, flagellum of 18 segments. Antenna 2, flagellum of 5-6 segments. Gnathopod 1, propodus more powerful, palmar margin more oblique than in female, lined on both sides with strong spines; dactyl without setae on inner margin except at base of nail, tip of which attains the posterior angle. Gnathopod 2, propodus widening distally, palmar margin more oblique, with strong spines. Peraeopods 3-5 slender, dactyls very long, nearly equal to half the length of the respective propods. Uropod 2, outer ramus directed laterally, inner margin with one, and outer margin with three, short spines, but no comb spines. Uropod 3, outer ramus slender, about twice the peduncle. Telson slightly longer than wide.

Note: Most of the material examined is larger than the topotype specimens and those from ponds and quarries in the Ottawa region have the telson more deeply cleft (Figure 19) among other differences.

Remarks: Many published references to the name "*Crangonyx gracilis*" lack specifically detailed information on the material; consequently, their precise determination is not possible. The description and figure of Weckel's "small form" from L. Michigan were probably based on the true *C. gracilis*, whereas her "large form" and that of Smith (1874, p. 565) from L. Huron were more likely *C. r. laurentianus* (p. 94). The locality records of Huntsman (1915) are within the expected range, but his Fig. 4c showing lateral spines on the telson and a small terminal joint on the outer ramus of uropod 3 is not referable to Smith's *gracilis*. The records of Johansen (1920) probably all apply to the true *C. gracilis*, except possibly those from the Ottawa R., and Fairy L., Hull Park, and Montreal West, Que., which may have been *C. pseudogracilis*. Hubricht's "subspecies" *C. g. gracilis* (1943) is based on material from 16 states in eastern U.S.A., that includes at least three and possibly five or more fully distinct species. The cave stream form *C. g. packardi* Smith is, in the writer's opinion, a valid full species.

Family TALITRIDAE*

Hyalella azteca (Saussure)

Amphithoe aztecus Saussure, 1858, p. 474.

Allorchestes knickerbockeri Bate, 1862, p. 250.

Hyalella dentata Smith, 1874, p. 609, fig. 1.

Lockingtonia fluvialis Harford, 1877, p. 54.

Hyalella knickerbockeri Weckel, 1907, p. 54, fig. 15.

Hyalella azteca Stebbing, 1906, p. 575; Saunders, 1933, p. 245, fig. 1; Shoemaker, 1942b, p. 80, 82; Bulycheva, 1957, p. 181, figs. 66a, 66b.

Distribution and Ecology: Continental N. America, Mexico north to the tree line in Canada and Alaska; Atlantic to Pacific, including coastal islands; in all permanent fresh water that reaches a monthly mean summer temperature of more than 10°C. Oviparous females in spring and throughout the summer.

Material Examined: More than 300 lots of specimens from nearly every province and state in the study region including the Queen Charlotte and Vancouver Islands on the west, and Newfoundland, Anticosti, and Prince Edward Island on the east; from lakes, ponds, sloughs, marshes, estuaries, rivers, streams, ditches, and spring streams; the most common and most widely distributed North American fresh-water amphipod crustacean.

Diagnosis (Figure 20): As described by Smith, Weckel, and others. The species appears to be somewhat variable morphologically.

The typical dorsal abdominal carination in both sexes consists of a small middorsal posterior projection of abdominal segments 1 & 2, occasionally (as in material from Prince Edward Island) on abdominal segment 3, and very occasionally also on thoracic segment 7 (Grand Etang, Que.). Two-, three-, and four-spined individuals have been noted in the same lot from the same body of water (Grand Etang), whereas others (Queen Charlotte Islands) approach the edentate condition in *H. inermis* Smith (1875) from Colorado. The serration of the posterior border of segment 2 of the pereopods is also variable; mature males from a lake near Macdidiarmid, Ontario, have about 12 such notches in pereopod 5, 8 or 9 of which might be called conspicuous, although in other localities the serrations may be stronger and more numerous. In general, material from northern localities has relatively large eyes and, in the male, the propod of gnathopod 2 is very broad and palmar margin is almost smoothly convex.

Mouthparts much as in *H. curvispina* (Shoemaker, 1942b); maxilla 1, inner plate relatively short and broad, bearing 2 plumose setae at the very apex; palp of outer plate very small and finely setose, elongate and minutely 2-jointed in the right maxilla, short-rounded and 1-jointed in the left. In the female, gnathopod 2 (described by Bate, 1862, as gnathopod 1), segment 2 slender, shallowly sigmoid in outline, anterior margin not expanded; segment 4 produced a little posteriorly, lobe armed with several spines and rows of small pectinate scales; segment 5, posterior distal lobe armed with a comblike row of about 15-20 short spines; segment 6 long and slender, produced postero-distally beyond base of short, curved dactyl which closes in semichelate fashion against the oblique palm and approaches the weakly chelate or 'mittenlike' condition seen in the land-dwelling Talitridae (*Orchestia*, etc.). Coxal gills on segments 2-7, double on 2-6. Brood plates large, triangular; margins armed with numerous hooked bristles that interlock with those of neighboring plates.

Remarks: For reasons previously stated (p. 90), "*Ampithoe dentata*" Say 1818 is more properly placed in the synonymy of *Crangonyx serratus* (Embody), rather than in *Hyalella azteca* as first suggested by Stebbing (1906).

*Bulycheva (1957) has promoted the Talitridae to superfamily rank (Talitroidea) containing three families (Hyalidae, Talitridae, Hyalellidae), the last of which *Hyalella azteca* is the type.

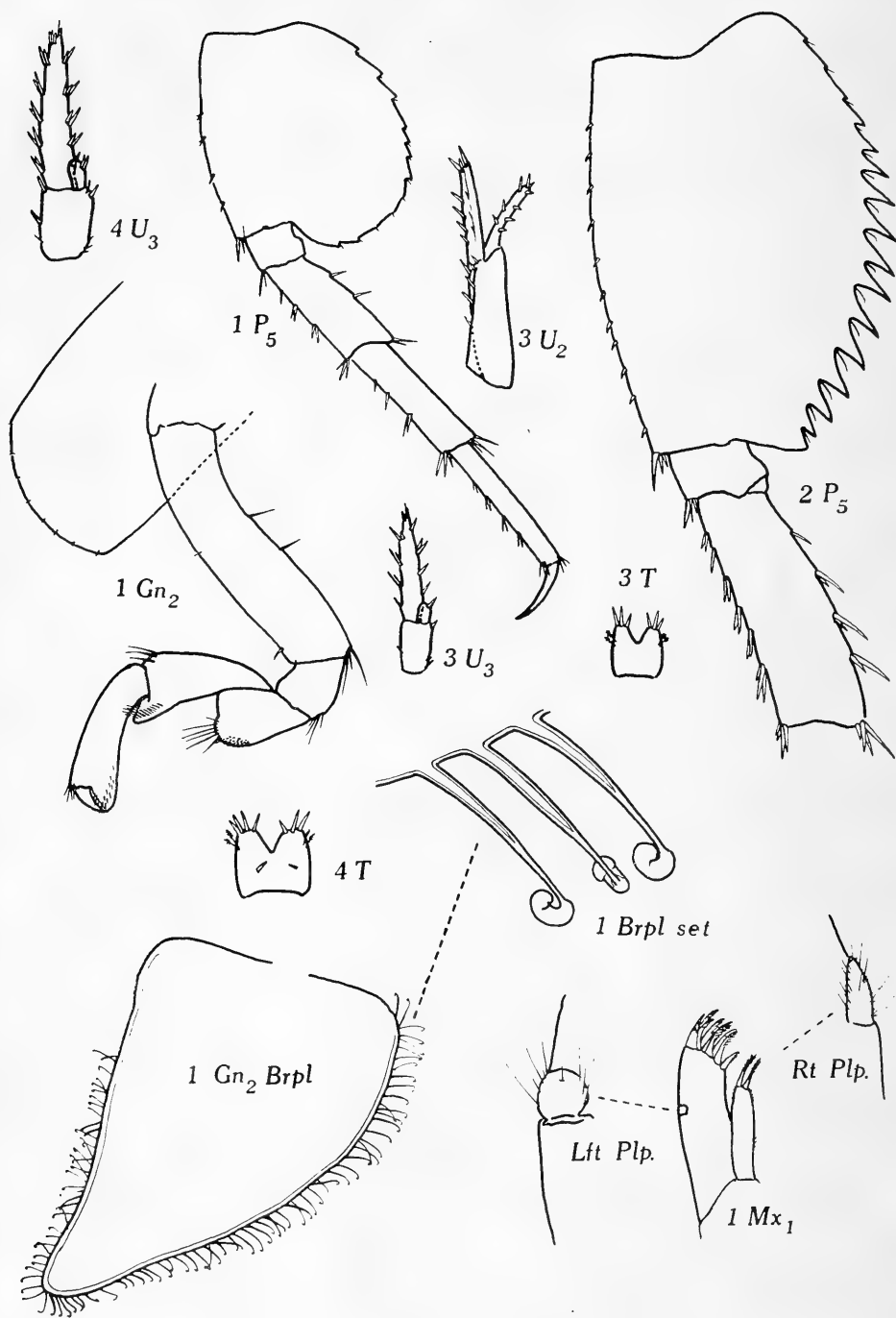


Figure 20. *Hyalella azteca* (Saussure) Lake near Macdiarmid, Nipigon Prov. Pk., Ontario. 1. Female, 7.0 mm.
Crangonyx serratus (Embody) Bower's Hill, Norfolk Co., Virginia. 2. Male, 12 mm.
Crangonyx richmondensis richmondensis Ellis Power's Pond, St. Phillip's, Nfld. 3. Male, 10 mm. 4. Female, 13.5 mm.

Family COROPHIIDAE

Corophium spinicorne Stimpson

Corophium spinicorne Stimpson, 1857, p. 514; Shoemaker, 1949, p. 74, fig. 6 (and synonymies); Barnard, 1954, p. 36; Carl, 1937, p. 450.

Distribution and Ecology: Low-brackish and tidal fresh water of bays and estuaries of the American Pacific coast, from southern California to Alaska; frequently encountered at the mouths of small fresh-water brooks in company with *Anisogammarus* spp. and *Paramoera columbiana*, above the reach of all but the very highest tides. Oviparous females, March to August; life span probably of one year.

Material Examined: BRITISH COLUMBIA: Queen Charlotte Islands, author coll., 1957: W. coast Graham I., stream mouth near Stiu Pt., N. side Gudal Bay, and S. side Gudal Bay, Cartwright Sound; also stream W. of Queen Charlotte City, Graham I., and N. side Copper Bay, Moresby I. Vancouver I., author coll., 1955: Quisitis Pt. (Ucluelet); Long Beach, N.W. end Wickaninnish Bay, above HW pools; Goldstream R., head of Finlayson Arm; stream mouths at Comox Bay, Nanoose Bay, Departure Bay, and Ladysmith Harbour. B.C. Mainland, author coll., 1955; Emmond's Beach and Kelly Bay, near Powell River.

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REVIEWS

Fifty Trees of Canada

By J. L. VAN CAMP. Second ed. Agincourt, Ontario, The Book Society of Canada, 1956. 64 p. 50 cents.

This booklet will continue to serve its purpose well in helping the novice to know the trees. For each species an outline drawing and brief statement of characteristics of the leaf, twig and fruit are given. All the common trees native in the area east of the Rockies, the pines, spruces, elms, oaks, maples, cherries, basswood, ironwood, tuliptree, etc., are treated along with two alien species, Norway spruce and Scotch pine. The booklet, a primer to the more exhaustive study of Canadian trees, is designed for the use of nature groups, boy scouts and school children in the field.

This second edition is essentially a reprinting of the first. No changes in the text have been made and some minor inconsistencies in detail and typography have been carried over. A brightly colored spray of foliage, an artistic representation of the national emblem, has been added to dress up the cover.

W. G. DORE

Insect Life in the Tropics

By T. W. KIRKPATRICK. London, New York, Toronto, Longmans, Green & Co., 1957. 146 fig., 311 p. \$6.30.

This book, as stated on the jacket, is an introduction to the natural history of tropical insects. Although the author indicates that it is addressed primarily to interested laymen it will probably appeal more to advanced amateur or beginning professional entomologists.

One might expect that a book with such an intriguing title would be unusually colorful, at least in its illustrations. In this case the title hides an introductory textbook of entomology in which tropical insect species have been selected to illustrate the discussions. Following an introductory chapter in which he defines the tropical environment, the author touches briefly on the general structure of insects, classification, de-

velopment, and reproduction. Subsequent chapters are concerned with locomotion, food and feeding habits, defence and protection, insect architecture, and insect communities. This is a lot to cover in three hundred pages, and some of the sections are very skimpy. Most of the species are common in Africa and in Trinidad where the author apparently has had considerable experience. However, much of the information presented is obtainable in general entomology textbooks. The writing style is somewhat too 'textbookish' for enjoyable reading, but it is lightened considerably by the personal nature of the observations and by the frequent use of appropriate quotations that range from the Biblical to Ogden Nash.

Unfortunately the author has attempted to steer a middle-of-the-road path between the popular or semipopular approach that stimulates the amateur and the studious writing that informs the trained worker. The resultant text is not particularly satisfying from either aspect, but is slanted toward the professional category. In some areas, particularly in the chapter on the general structure of insects, the subjects are simplified to the point of error. A number of statements might be cited in this regard: "This skin, or cuticle, is composed of chitin"; "The wings are formed of two layers of thin membrane strengthened by a framework of tabular veins"; "Many insects have no auditory organs and are deaf." In other ways the discussions, such as of the distinctions between parasites and parasitoids, the theory of insect mimicry, or Uvarov's phase theory of locust migration, would scarcely be appreciated by the amateur and might be criticized by the professional. There is no list of references. The descriptive classification of insects is inadequate for identification, particularly by amateurs, and the illustrations, comprising black-and-white photographs and line drawings, are little help in this regard. They serve mainly to illustrate

morphological features.

The preparation of an introductory guide to tropical insects is a formidable task and the author, obviously a keen observer of insect ways, should be commended for attempting it. Certainly such a guide, more reasonably restricted to the common species of a definite tropical region, would be a welcome addition to the literature. The present volume, it seems, fills the need in only a small way.

JOHN W. ARNOLD

Flora of the British Isles—Illustrations, Part I

By SYBIL J. ROLES. A companion volume to the text by A. R. Clapham, T. G. Tutin and E. F. Warburg. Cambridge, University Press, 1957. 144p. \$4.25.

This first instalment of the illustrations for the new *Flora of the British Isles* has been eagerly awaited by the users of that excellent manual. It contains the illustrations, in the same sequence as the text, of all the ferns, the conifers, and the dicotyledons up to the end of Leguminosae, here called Papilionaceae. The portion of the dicotyledons includes such important families as Ranunculaceae, Cruciferae, Violaceae, Caryophyllaceae, Chenopodiaceae, Geraniaceae and Leguminosae but others which North American botanists might expect to find, such as Salicaceae, Polygonaceae, Saxifragaceae and Rosaceae, are not included.

There are 552 illustrations. They are all line drawings, of rather good quality and, apart from the character imparted to them by the artist, are much like those in earlier British manuals such as the *Handbook of the British Flora* by Bentham and Hooker. The figures are now reproduced four to a page but perhaps it is the intention of the publishers to reprint them when all are completed in a volume with format comparable to the text.

The legends consist only of the botanical name, common name, and color of the flower. As a supplement to the text, the picture will find much use, but used separately as a field guide they will be of little help since descriptive material

indicating the finer diagnostic features is in many instances necessary.

The *Flora* is by no means out of place in the Canadian botanist's library. Practically all of our adventive plants, the weeds of fields and waysides, many garden plants, and practically all the constituents of our meadows, lawns and pastures are included. Indeed, one might well refer here to see if we do not have some species at our very doorsteps which are not properly recognized in current North American manuals. There are also included some native North American plants which have established themselves in the British flora.

W. G. DORE

Using Wayside Plants

By NELSON COON. 2d rev. ed., 1958. Published by the author, Box 287, Watertown 72, Massachusetts. 254 p. \$3.00.

Man's long association with plants can easily be overlooked, especially by city dwellers. In an age of canned foods and packaged breakfast cereals, plastics and decorative mobiles, pills and synthetic dyes, we are apt to be unaware of the enduring part that plants can and do play in our lives. Limiting himself to a hundred plants Nelson Coon tells us how they may provide us with profitable use and fascinating pastime.

Using Wayside Plants is not written for the acquisitive or the profit-loving or the queer. Its author is not a faddist. He gives us rather, from his long and intimate association with plants, a fresh look at things that grow and he tells of ways that our enjoyment of them may be increased. In addition to accounts of many common plants that may be used for food and medicinal purposes the writer tells of others that are useful for dyeing, for children's playthings or for household crafts. His keen observation for beauty in wild plants finds decorative use even in the skunk cabbage. The author also provides a list of several shrubs that are worth planting around the home.

It is doubtful if many readers will want to spend the time or use the amount of

gas or electricity needed to make many of the preparations, but the directions still provide engrossing reading. One who is just beginning to learn about plants will find absorbing interest in every page and one who is not a novice will find a nostalgic charm in the book.

ROBERT A. HAMILTON

The Fishes of Ohio

By MILTON B. TRAUTMAN. Illus. keys. Columbus, Ohio U. Press, 1957. 683 p. \$6.50.

Many publications have appeared dealing with the fishes of individual states but this is one of the most ambitious of them all. It not only describes 160 species but deals with conditions affecting their occurrence and distribution and with ecological changes that have affected their distribution and abundance.

For each species there is the following information: (1) a black and white detailed original drawing to scale accompanied in many cases by drawings of the young where they differ in pattern of markings or in other characters from the adult, and of diagnostic features useful in identification, (2) large maps of Ohio indicating past and present distribution in the state, (3) smaller maps showing total North American distribution, (4) description including characters distinguishing the species from others with which it may be confused, (5) coloration, (6) usual size and record of weight for Ohio, (7) hybridization where it occurs, (8) under Ohio distribution some account of present and past abundance, (9) habitat.

Besides more than 800 black-and-white illustrations, there are seven full-page color plates showing 21 species.

Keys for identification include an abundance of detail that should make them much more useful than most keys, not only for the nonscientist, but also for the ichthyologist. The amount of detail is indicated by the fact that the key to the species and subspecies covers 40 pages. The key to families is illustrated with outline drawings.

The thoroughness of treatment is in-

dicated by the fact that in presenting the keys not only is there a glossary of technical terms and directions for the use of keys but also careful directions for methods of counting and measuring and accounts of equipment and materials necessary for identification and of variations within species. Features which often puzzle the nonscientific reader, such as differences in common names and changes in scientific names, are discussed.

The accounts of conditions affecting past and present distribution include an account of the glacial and early post-glacial history of Ohio and changes due to settlement and industry. A useful feature of these presentations are brief summaries of the salient features of changes in geological and historical times.

As a source book of information on the characters and occurrences of the fishes dealt with this book is invaluable to ichthyologists, students, commercial fishermen, sportsmen and field naturalists, not only in Ohio but in many surrounding states and neighboring parts of Canada. Of the 160 species included more than one hundred occur in Ontario. There are, however, in Ontario at least 25 species not found in Ohio, and the disparity between the fish fauna of Ohio and that of provinces east and west of Ontario increases with distance.

However, this is not only a work of reference, it contains a wealth of information for anyone interested in animal life. We read for instance that "the Muskellunge was one of the first species to become commercially important. Until 1850, the bulk of the commercial catch was taken by spearing the fishes as they passed beneath holes in the ice or swam over riffles and by hauling seines in the marshes, streams and shallow bays, either beneath the ice or after it had disappeared. . . . After 1855 fyke, pound and trap nets, set in the bays and open lake became increasingly important."

This is the rich harvest of thirty years of assiduous and devoted work in pursuit of knowledge about fishes especially in Ohio.

J. R. DYMOND

The Edge of April, a Biography of John Burroughs

By HILDEGARD HOYT SWIFT. Ill. by Lynd Ward. New York, William Morrow and Company, 1957. 316 p. \$4.75.

The author of this book has chosen a very appropriate title. John Burroughs was born at "the edge of April" and it is the time of year he most loved.

This is a junior book for age 14 and up. In it, the author has attempted to create a living picture of John Burroughs by writing about selected events in his life and welding them into a progressive narrative. It is written in a very easy, readable style and although the naturalist is described in the third person, the reader feels he is reliving Burroughs' life and seeing through his eyes the plants, animals, and people that surrounded him.

The first of the three main parts covers the period of Burroughs' life from his birth on April 3, 1837, to seventeen years when he broke away from his family to teach school. It is the best written of the three and portrays the child, with his perception and awareness of things around him, in an acutely vivid manner. For the reader who has explored a marsh and found his first spring peeper, chapter two will hold special enchantment as he relives this discovery with John Burroughs, age five. The use of the colloquial expressions and manner of speech used in the area around the Burroughs' farm in the Catskill Mountains of New York in the 1840's adds realism to the scenes.

In the second section Burroughs is seen as a young man. A large part of this period of his life was spent in Washington and it was during his stay there that he met Walt Whitman, who became one of his closest friends, shared Burroughs' love of natural history and encouraged him to write about it. Although this was an important formative period in Burroughs' life, the author dwells perhaps too long on Burroughs' marital difficulties

and on the events of the war between the states rather than stressing his love of natural history which remained his primary interest throughout this period and set the future course of his life.

Part three deals with Burroughs' life as an established and famous naturalist and writer. During this period he moved from Washington to a fruit farm on the Hudson River where he supervised and helped to build his own home, Riverby. This section, which includes excerpts from some of the naturalist's writings and descriptions of his trips in the vicinity of Riverby, helps recapture the joy of tramping the country and seeing nature through the eyes of Burroughs but it lacks the verve and excitement of discovery described so vividly in the first section, even though Burroughs apparently retained this capacity to the time of his death in 1921.

Although the author has admittedly chosen incidents from the life of John Burroughs which she thought best illustrated the personality of the man, she has blended them into a life story that moves along smoothly without obvious interruption in the first part of the book. However, in the last section, large gaps occur as the author tries to cover a long and important period of Burroughs' life in a short space. Consequently, some of the continuity is lost and the reader's interest may lag periodically. As compensation for the large gaps in this section, a bibliography and a list of books published by Burroughs between the years 1867 and 1922 are included.

The beautiful illustrations by Lynd Ward depict scenes, birds, and animals observed and described by Burroughs. In some of the scenes, Burroughs himself is shown in childhood, youth, young manhood, and in his later years when he was familiar to so many readers and lovers of natural history.

RUTH HORNER ARNOLD

Letters to the Editor

Request for Information on Monotone of Chickadee

In the course of a visit to Martha's Vineyard, Massachusetts, during April 12 to 19, 1957, I became impressed by the fact that, in the vast majority of cases, both notes of the "fee-bee" call of the Black-capped Chickadee *Parus atricapillus* were on the same pitch. Since the main purpose of my visit to this island was to search for premature or extra-limital straggler birds, I made no intensive study of the chickadees' "song." However, I did determine that the normal version of the "fee-bee" call, in which the first note is higher than the second, was distinctly the exception rather than the rule on Martha's Vineyard at the time of my visit.

The purpose of this note is to ask if any readers of the *Canadian Field-Naturalist* have observed Black-capped Chickadees making a regular practice of uttering their "fee-bee" call in such manner that both notes are on the same pitch. I would be particularly interested in learning whether the species is known to do so in the Maritime Provinces.

AARON M. BAGG

Dover, Massachusetts

Request for Information on Purple Martin Abandoning Loft

In April 1957 my Purple Martin loft, situated in the village of Manotick, Ontario, was duly occupied by the usual complement of 12 couples in 16 apartments. This particular loft had been in use for the last 12 years. The first year I was lucky to have two couples take possession of the loft and the number has since increased until the full complement was established.

This year in the middle of July when the fledglings were fairly well feathered the parents suddenly deserted the loft and consequently left the young to starve. I took down the loft in September and found 20 young birds dead. Taking no chances I have erected a new loft ready for next spring.

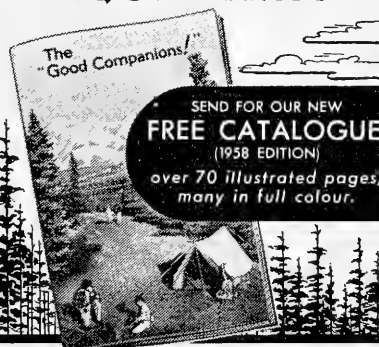
One theory advanced is that trees may have grown sufficiently near the loft to hamper the flight in taking off and landing. This cannot be the cause of the desertion as the fledglings were more than half grown. Besides, there are two good channels leading to the river, their favorite feeding grounds.

I should like to know of any other lofts having been so abandoned.

Ottawa, Ontario

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The CANADIAN FIELD-NATURALIST

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STUDIES OF THE BYRON BOG IN SOUTHWESTERN ONTARIO

II. THE SUCCESSION AND DURATION OF BLOOMING OF PLANTS¹

WILLIAM W. JUDD

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London, Ontario

THE Byron Bog near London, Ontario, has been described by Judd (1957) and included in that description is an account of the zonation and distribution of the vegetation. During 1956 a study of the succession and duration of the blooming of twenty of the predominant plants in the bog was undertaken. These are all plants mentioned by Judd (1957) and represented by sheets in the herbarium of the writer and in the herbarium of the Department of Botany, University of Toronto. The method used in the study was to select plants of each species and to make a count each day of the number of flowers in bloom on the selected plants. The plants were selected while the flowers were still in bud except for a few cases when the species was not discovered until blooming had begun. The sample and number of plants chosen for use in counting flowers, as well as the definition of blooming of flowers of each species, are indicated in the following account.

The results of the study are presented in Figure 1, showing the period of blooming and the date of appearance of the maximum number of blooms for each species. The series of three dates, mentioned for each species in the following account, are those of the first blooming, the maximum blooming and the last blooming respectively. The figure in brackets following the date of maximum blooming is the number of flowers in bloom, on the selected plants, on that date.

LEATHERLEAF *Chamaedaphne calyculata* (L.) Moench. Flowers on three branches of shrubs; opening of corolla to withering or dropping of corolla: ?—May 21 (68)—June 1.

BOG ROSEMARY *Andromeda glaucophylla* Link. Flowers on three branches of shrubs; opening of corolla to withering or dropping of corolla: May 25—May 30 (6)—June 12.

BLACK HIGH-BUSH BLUEBERRY *Vaccinium atrococcum* (Gray) Heller. Flowers on three branches of shrubs; opening of corolla to withering or dropping of corolla: May 26—May 30 (35)—June 8.

¹A project supported by funds from the government of Ontario granted through the Ontario Research Foundation. The data were assembled while the writer held a Summer Research Associateship of the National Research Council in 1956.

BOG LAUREL *Kalmia polifolia* Wang. Flowers on three branches of shrubs; opening of corolla to dropping of corolla: June 1—June 7(18)—June 20.

PURPLE CHOKEBERRY *Pyrus floribunda* Lindl. Flowers on three branches of shrubs; opening of corolla to dropping of petals: June 1—June 7(22)—June 11.

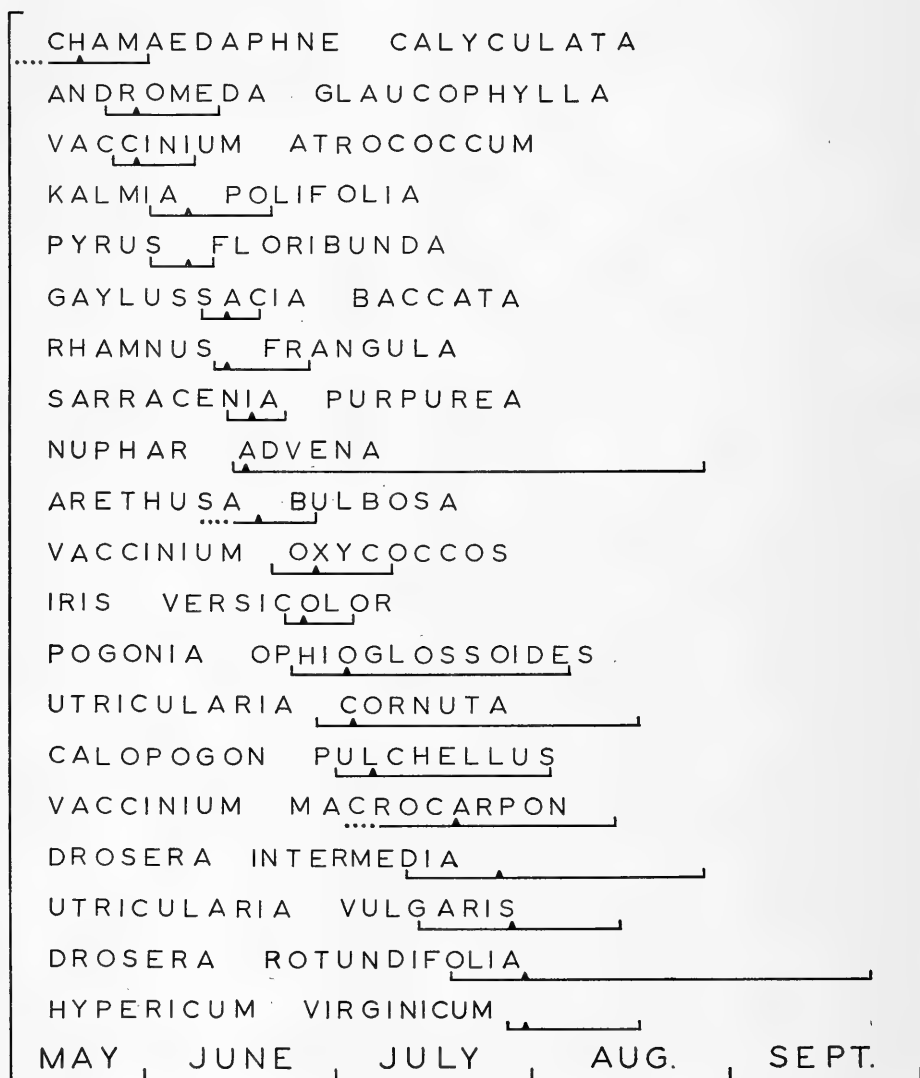


FIGURE 1. Succession and duration of blooming of twenty plants in the Byron Bog in 1956. A series of dots precedes the solid line on the graph for those species for which counts were started after blooming had begun and the black triangle on each line indicates the day on which maximum blooming occurred.

BLACK HUCKLEBERRY *Gaylussacia baccata* (Wang.) K. Koch. Flowers on three branches of shrubs; opening of corolla to withering or dropping of corolla: June 9—June 13 (45)—June 18.

ALDER BUCKTHORN *Rhamnus frangula* L. Flowers on three branches of shrubs; opening of perianth to closing of perianth around pistil: June 11—June 13 (9)—June 26.

PITCHER PLANT *Sarracenia purpurea* L. Flowers on six plants; stages in blooming were: opening of sepals, opening of petals, turning of flower to face outward from its stalk, dropping of petals, dropping of stamens: June 13—June 17 (6)—June 22.

SPATTERDOCK *Nuphar advena* (Ait.) Ait. f. Flowers on plants in a small bay of a pond south of Redmond's Pond; opening of calyx to dropping of sepals: June 14—June 16 (7)—August 27.

SWAMP PINK *Arethusa bulbosa* L. Flowers on ten plants; opening of perianth to withering of perianth: ?—June 18 (10)—June 27.

SMALL CRANBERRY *Vaccinium oxycoccos* L. Flowers on plants growing on one square foot of *Sphagnum* tussock; opening of corolla to withering or dropping of corolla: June 20—June 27 (10)—July 9.

BLUE FLAG *Iris versicolor* L. Flowers on two plants; opening of corolla and style to withering of corolla and style: June 22—June 25 (5)—July 3.

BEARD FLOWER *Pogonia ophioglossoides* (L.) Ker. Flowers on eight plants; opening of perianth to withering of perianth: June 23—July 2 (5)—August 6.

BLADDERWORT *Utricularia cornuta* Michx. Flowers on seven plants; opening of corolla to dropping of corolla: June 27—July 3 (8)—August 17.

GRASS PINK *Calopogon pulchellus* (Salisb.) R. Br. Flowers on six plants; opening of corolla to withering of corolla: June 30—July 6 (8)—August 3.

LARGE CRANBERRY *Vaccinium macrocarpon* Ait. Flowers on cluster of plants on sides of a *Sphagnum* tussock; opening of corolla to withering of corolla: ?—July 19 (10)—August 13.

SUNDEW *Drosera intermedia* Hayne. Flowers on plants growing on one square foot of sodden *Sphagnum* moss; opening of corolla to withering and closing of corolla around pistil: July 11—July 26 (29)—August 27.

BLADDERWORT *Utricularia vulgaris* L. Flowers on plants in a small bay of a pond south of Redmond's Pond (same bay as for *N. advena*); opening of corolla to dropping of corolla: July 13—July 28 (4)—August 14.

ROUND-LEAVED SUNDEW *Drosera rotundifolia* L. Flowers on twelve plants; opening of corolla to withering and closing of corolla around pistil: July 18—July 30 (6)—September 22.

MARSH ST.-JOHN'S-WORT *Hypericum virginicum* L. Flowers on two plants; opening of corolla to withering or dropping of corolla: July 27—July 30 (3)—August 17.

REFERENCE

Judd, W. W. 1957. Studies of the Byron Bog in southwestern Ontario. I. Description of the bog. Can. Ent. 89:235-238.

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OBSERVATIONS ON THE LESSER SNOW GOOSE NESTING GROUNDS EGG RIVER, BANKS ISLAND

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LESSER SNOW Geese *Chen hyperborea hyperborea* (Pallas) are the commonest of the subfamily Anserinae in the western Arctic, where also are found black brant *Branta nigricans*, Canada Goose *B. canadensis*, White-fronted Goose *Anser albifrons*, and Ross's Goose *Chen rossi*. Four local nesting grounds of Snow Geese are distributed along 180 miles of the Arctic coast, on the deltaic islands south of Kendall Island, Cape Dalhousie, and the deltas of the Kugalik and Anderson Rivers. North and west of those, a fifth is located along the Egg River, Banks Island. Ground observations were made by the author on the Kendall Island nesting ground in 1954 and on the Egg River nesting ground in 1955.

The 1955 observations were made from June 23 to July 4 as part of a faunal study of Banks Island. During that period the processes of incubation, hatching, dispersal and predation were observed. Apposite features are used in this report comparing the Kendall and Egg River areas.

DESCRIPTION OF THE EGG RIVER NESTING GROUND

The Egg River nesting ground, the largest of those mentioned, is located on both sides of the river where it joins Big River, about 16 miles from the west coast of the island. It is six miles in length, averages one and a half to two miles in width, and occupies an area of 10 to 12 square miles. No evidence of nesting was found outside of the area occupied in 1955. The nests were concentrated somewhat in the northern three-quarters of the area, especially on the east side of the river near the mouth.

The Egg River is a clear, shallow, braided stream with a gravel bed. Four miles south of its mouth, it divides into three branches. Four habitat types were found in the nesting area: wet mossy grass on the western side; sparsely vegetated gravel flats and bars in the middle section; and sloping gravel shores and a gently sloped bank of organic material along the eastern side. Shallow lakes are scattered throughout the area, especially near the mouth of the Egg River and on its eastern side.

SPRING MIGRATION

In 1955, the spring migration occurred from May 17 to June 4, approximately 20 days, reaching a peak on May 30. Höhn (1954) noted that the 1953 migration extended from May 18 to mid-June, with a peak on May 29. According to some Eskimos, the spring migration may be completed in a few days.

The spring route from the interior mainland to Banks Island is partially known. The Anderson River is the logical route to the coast, and in 1952 many goose feathers and droppings were found by the author along the river below the forks. Soper (1949) considered that the large influx of Lesser Snow

Geese into the Anderson River delta for brief periods in the spring and autumn consists of migrants of the Banks Island population.

In 1955 the migration was observed at various points from Cape Kellett to Cape Lambton, a distance of 90 miles. The geese arrived in waves of small flocks. Some of them reached Cape Kellett and along the west coast from the direction of Baillie Island. Others reached Cape Lambton from the direction of Cape Parry, followed the west coast to the Masik River, and continued north towards the Egg River.

After arriving along the west coast of Banks Island, the flocks of geese rested and fed on the grassy coastal slopes and river banks. During the first part of the migration, flocks of geese were seen flying randomly along the coast and Sachs River. In late May, the geese tended to fly directly inland, following depressions or gullies between the ridges.

NESTING DATA

Prenesting activities and associated behavior were not observed, since the study did not start until June 23, four days before hatching commenced. Assuming an incubation period of 21 to 22 days (Manning, 1942; Cooch, 1954), egg laying was probably under way by June 6.

On June 24, the number of nests and eggs were counted in a strip from the west side northeast to the channel and southwest to the west side of the river. On June 27, a second transect was conducted along the west side from the camp south to the end of the nesting area. In Table 1, the frequency of occurrence of clutch sizes of 920 nests is given. The number of eggs per clutch varied from two to nine, averaging 3.88. On the deltaic islands the number of eggs in 186 nests averaged 3.7, and ranged from one to eight (McEwen, 1954). On Southampton Island, Cooch (1954) recorded the average clutch size as 4.10 for 1,726 nests in 1952 and 3.97 for 1,300 nests in 1953. The reason for the lower average clutch sizes at the deltaic islands and Egg River may be that the samples were smaller and their periods of exposure to predation were longer.

TABLE 1. FREQUENCY OF OCCURRENCE OF EGGS IN 920 NESTS

Sample Strip Number	Number of Eggs								Total Number Nests	Total Number Eggs	Average Clutch
	2	3	4	5	6	7	8	9			
1	63	246	302	127	36	22	2	1	799	3,102	3.88
2	3	42	52	19	3	1	1	—	121	468	3.87
Summary	66	288	354	146	39	23	3	1	920	3,570	3.88

The nests, in most cases, were constructed on previous nest sites and consisted of elevated heaps of organic material lined with down. On gravel bars, they were down-lined depressions in the gravel. Nests were found in the crevices of polygons and organic deposits. Some nests were found near the top of a gravel ridge about 200 feet in height, others on a grass-sedge plateau, 50 to 150 yards from the river bank.

HATCHING DATA

The first evidence of hatching was observed on June 27. The average size of 419 broods counted between June 28 and July 3 was 3.33. Cooch (1954) reported that hatching occurred on Southampton Island from June 30 to July 10 in 1952, and from July 5 to 16 in 1953. In Table 2, six samples of brood counts are listed. Sample variation during the seven-day period was small. The counts were made from elevated positions along the river as the family groups moved freely out of the nesting area. The difference between the average brood size and clutch size was 0.55 per clutch. This loss occurred during the last stage of incubation and the first week of hatching. The calculation does not include egg losses during incubation or the complete loss of clutches.

TABLE 2. NUMBER AND AVERAGE SIZE OF 419 BROODS

Date	Number of Broods	Total Number Young	Average Brood Size
June 28	21	72	3.43
29	32	100	3.12
30	35	113	3.23
July 2	93	308	3.31
3	111	377	3.40
3	127	416	3.28
Summary	419	1,386	3.33

DISPERSAL FROM THE NESTING GROUNDS

On the second day of hatching, adults and broods began leaving the area. The dispersal was in three directions: northeast from the east side of the river, northwest from the mouth of the river into Big River, and west-southwest from the west side of the river towards Lennie River. By July 3, the geese had almost completely deserted the nesting grounds. The largest number moved into the Big River flats. Snow Geese accompanied by broods have been seen as far north as Storkerson Bay (Manning, 1956). From the Egg River, the geese dispersed towards the coast between the Lennie River and Storkerson Bay.

FACTORS OF MORTALITY

Forces acting to reduce the goose population included animal predation by arctic fox *Alopex lagopus*, wolf *Canis lupus*, Glaucous Gull *Larus hyperboreus*, Parasitic Jaeger *Stercorarius parasiticus*, Pomarine Jaeger *S. pomarinus*, and Long-tailed Jaeger *S. longicaudus*, human predation and adverse weather. The last-named is considered the most important control factor on the deltaic islands, and possibly in certain years on the Egg River nesting area. Animal predation appears to be the least important.

Arctic foxes were believed to be the most active and successful predators. From June 23 to July 4, 35 observations were made of foxes hunting on the nesting area. The largest number of foxes observed in one day was nine. On the first sample strip 42 nests or 4.8 per cent were destroyed by foxes and 32 or 3.7 per cent by unidentified agents, probably foxes; and 799 or 91.5 per cent were occupied. No data were available for the second sample strip.

Nests destroyed by arctic foxes may be found empty or with egg shells scattered about. When a fox locates an unattended nest it usually takes an egg in its mouth and carries it with the ends protruding. It digs a shallow hole in the ground, deposits the egg in it, and pushes dirt over the egg with its nose. This operation continues until all the eggs are taken, or until the geese return and defend their nest. The fox often recaches eggs. One fox was observed to recache the same eggs three times in the same area during 30 minutes of observation.

The fox retreats when attacked by the gander or a mated pair. Occasionally fake attacks were made by a fox to flush a goose from the nest but this feigning act was never successful. Because of these observations it is considered that the 26 geese whose carcasses were found partly consumed by foxes may have died from natural causes.

Unlike terns and gulls, which are also colony nesters, the geese were not stimulated to group defense by the presence of a fox or other intruder. Each pair restricted its defense to its own nest or brood. Geese remained alert to the presence of a fox at a neighboring nest but waited to attack it until it approached them. The foxes noted also worked independently of each other.

Wolf predation appeared to have very little effect on the goose population. Three single wolves were seen traveling amongst the nests without molesting the adults or their eggs. Adult geese showed fear of a wolf and took to flight, usually at four to six feet above the ground. The wolf scat found consisted entirely of goose feathers.

Collared and Back's lemmings frequently observed near nests, were not considered predators. Lemmings which come too close to a nest are killed by the geese. Three lemmings were found which had been killed by geese.

The Long-tailed was the commonest of the three species of jaegers. Thirty-nine of them were seen, as compared to one or two of the other species. Jaegers were continuously flying over the nesting area in search of food. Inland from the river two Long-tailed Jaeger nests with eggs in them were found. Predation by a jaeger can be identified by a small hole picked in the egg, usually with beak marks around the edge of the hole. Seventeen eggs, or 0.54 per cent of the eggs counted, were destroyed by jaegers.

A colony of Glaucous Gulls nested on the area. No egg predation by gulls was observed. Downy young geese which strayed or lagged behind the brood were easy prey for the gulls. Only one instance of gull predation on a young goose was observed. Unhatched eggs and partially hatched deserted clutches also form part of the gull and jaeger diets. Cooch (1954) found that a total of 9.6 per cent of the eggs produced in 1952 and 1953 on the Southampton Island nesting ground were destroyed by avian predators. The amount of avian predation on the Egg River nesting ground was not determined.

The raven population on Banks Island was small. No ravens were seen on the nesting area.

Human predation was not a factor in 1955 because the R.C.M. Police detachment at Sachs Harbour enforced the regulation against spring hunting and eggng.

Unfavorable weather conditions such as an early spring thaw followed by severe cold in late May, prolonged wet rains with strong gusty winds, or flooding of the nesting area by a combination of high tides and gale winds at a critical phase in the life cycle can substantially lower the nesting success of goose populations. In 1955, climatic conditions were favorable but not ideal. Most of the snow on the land disappeared after an early thaw from May 15 to 20. The warm weather was followed by snowflurries for three days. The month of June, an important month which included the period of nesting, incubation, and hatching, was cold, with strong winds and snow. Up to June 21, rain or snowflurries and strong winds prevailed along the west coast. The weather inland along the Egg River was probably just as severe. From June 23 to July 4, the temperatures remained above freezing, ranging from 1° to 16°C. A few geese succumbed when two days of strong winds accompanied by rain occurred during the hatching period. Two adults were found dead near their nests. One adult female was picked up in an emaciated condition and was destroyed. Two dead goslings and eight deserted nests, containing a total of 28 eggs, were found.

Unlike most goose nesting areas, the Egg River nesting ground is not likely to flood. The mouth of the river is beyond the influence of tidal-gale water fluctuations. Flooding has occurred on the deltaic islands of the Mackenzie and on the Anderson River delta, resulting in heavy nest destruction.

POPULATION ESTIMATES

Population estimates for the Egg River goose population vary from 15,000 (Smith and Sutton, 1952) to 120,000 (Manning, 1956). The aerial survey conducted by Smith and Sutton in late July along the west coast was limited by weather conditions and considered incomplete. Höhn (1954) estimated 30,000 geese nesting along the Egg River in 1953, but predicted a total of 100,000 in some years.

An attempt was made to get a total count of the geese nesting in the Egg River area by dividing the area into four sections and counting the geese in each section, using a 20-power telescope and 6 × 30 binoculars, from elevated positions on the ridges along both sides of the river. On June 25, 7,329 geese were counted; on June 26, 12,960; and on June 28, 12,553. (No count was taken on June 27 because of unfavorable weather.) Hatching had commenced and a slight shifting of the geese on the area was noted, so the remaining section was not counted. However, the geese in that section were estimated at 8,000. The nesting populations thus totaled about 41,000. Possible sources of error were duplication of observations at long distances, movements of geese to and from the nesting area, birds hidden from view by depressions and elevations, and personal error. Höhn's prediction of possible nesting population of 100,000 is considered excessive as the total nesting areas were occupied in 1955.

Four Blue Geese paired with Snow Geese were seen. One of the Blue Geese was blue-bellied and three were white-bellied. Blue Geese are rare in the Mackenzie Delta. None was seen on the Kendall Island nesting area in 1954. Four immature snow geese were observed in the Egg River area although immatures are rarely seen on the nesting ground.

Nonbreeding geese were observed on the flats of the main rivers flowing to the west coast. A total of 8,350 was estimated, as follows: 50 at the Kellett River on June 7; 4,000 along the Lennie River on June 28, 300 west of the Egg River on June 23; and 4,000 on the north side of the Kellett River on July 7. Nonbreeding and molting geese were seen by Manning (1956) between Big and Storkerson Rivers, with a few as far north as 10 to 20 miles inland on the Thomson River. Without allowing for these groups the total population for the island is estimated at approximately 50,000. In a successful nesting season, producing an average of three young per pair, the potential production would be about 60,000 young. Thus the autumn population might be more than 108,000.

AUTUMN MIGRATION

Discussion of the autumn migration from Banks Island to the wintering grounds in California must be limited to generalities because of the paucity of data. Flocks of geese fly from the Big River flats and possibly Storkerson Bay about the end of August. Some Eskimos reported that flocks of geese have been seen flying over Booth and Baillie islands. The migration passes over Tuktoyaktuk during the first week in September. It is uncertain whether the geese continue west into the Lower Mackenzie Delta or south along the east side of the Mackenzie River. About mid-September a large concentration of snow geese remains in the lower Mackenzie Delta for about two weeks. These geese may be from the Kendall Island population or include some of the geese from Banks Island. One of the 300 geese banded on the Kellett River in 1955 was taken in the Delta at Shallow Bay, Y.T., an area of autumn concentration.

The remaining 13 band returns were from along the Central and Pacific Flyways as follows: Hay Lakes, Alta. (1), Oregon (3), Montana (1), Nevada (1), California (6) and Mexico (1). Geese banded at Tule Lake National Wildlife Refuge and the Sacramento National Wildlife Refuge, California, have been taken at Sachs Harbour, Banks Island. A greater number of band returns and observations of marked individuals are required before the routes of the spring and autumn migrations of these geese are known.

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VARIATION IN A LITTER OF NORTHERN WATER SNAKES FROM OTTAWA, ONTARIO

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IN VIEW of the present trend in taxonomy of considering a large sample of a population as the valid taxonomic unit rather than the individual specimen, it is well to have evidence of the degree to which individuals can vary within one population. A wide range of variation among adults in any given population is not surprising, but when such variation occurs within the progeny of one female, the taxonomist may experience a rude awakening. For example, Brimly (1927) reported on two female Northern Water Snakes which had progeny with color patterns of both *Natrix sipedon sipedon* and *N. s. fasciata*. The litter described in the present paper is not comparable in that respect, but it does surpass the degree of variation recorded for 42 adult *N. s. sipedon* collected from many parts of eastern Ontario and western Quebec.

A gravid female Northern Water Snake, 41 inches in total length, was caught on August 31, 1956, in the Ottawa River, at Britannia Bay, near Ottawa, Ontario. On October 16, from about 8 A.M. to 4 P.M. she gave birth to 42 young. Nearly 30 of the young were born before 1 P.M. Two died soon after birth and were preserved. The remainder were kept alive for nine days, given only water, and then killed (with ether), photographed, sexed, and measured. The female was a typical *N. s. sipedon* with eight upper and ten lower labial scales, one preocular and three postoculars, 146 ventrals, 67 caudals and with the first five bars on the back forming complete crossbands.

Her progeny, however, exhibited a degree of variation which transcends that shown by 42 adult *N. s. sipedon* taken within a 70-mile radius of Ottawa.

SEX RATIOS

Forbes (1940) reported the sex ratios found in *Storeria occipitomaculata*, *Crotalus*, and *Sistrurus* as being nearly 1:1. Martof (1945) also records a 1:1 sex ratio in a litter of 85 *Thamnophis sirtalis sirtalis*. A litter of 32 *Natrix s. sipedon* from Portland, Leeds County, Ontario (55 miles south of Ottawa) examined by me had two malformed individuals, 14 females and 16 males again nearly a 1:1 ratio. However, the Ottawa litter had one malformed individual, 13 females and 28 males, a sex ratio of 1 female: 2.1 males.

It is interesting to note that of the 42 adult *N. s. sipedon* caught in eastern Ontario and western Quebec, the females predominate with a ratio of 1.6 females: 1 male. Admittedly this is a small sample and there are many variables, but it does emphasize the fact that there can be a wide discrepancy between the apparent sex ratio of the adult population as determined by random sampling and the actual sex ratio of a litter of that species.

VARIATION IN PIGMENT PATTERN

No two specimens in the Ottawa litter have the same pattern. The pattern in the anterior portion of the body varies from the typical vertical barred pattern (Figure 1,A) through a broken-bar pattern (Figure 1,B), where the tip

of the bar is separate, to a condition in which the separate spots form a lateral stripe (Figure 1,C). When the 42 specimens are arranged in a series, this pattern change is most gradual, but it is interesting to consider that if only the extremes had been at hand, one might have been tempted to describe a new subspecies.

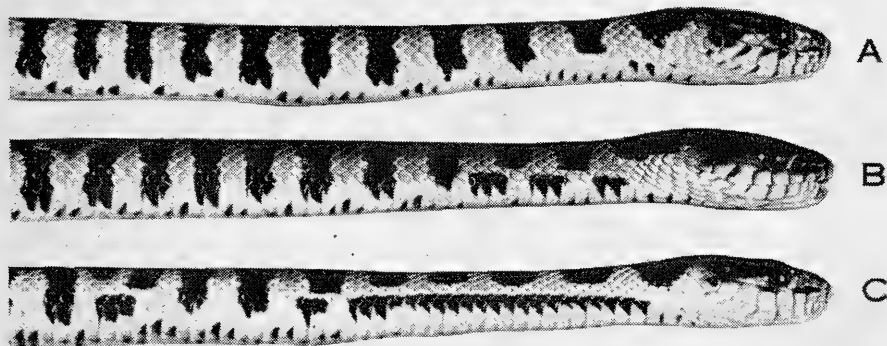


FIGURE 1. Male *Natrix s. sipedon* from the Ottawa litter selected to show range of variation in color pattern.

Males and females are distributed rather evenly through this color pattern series except in the 11 most aberrant examples (that is, those tending toward a lateral stripe) of which 9 are males.

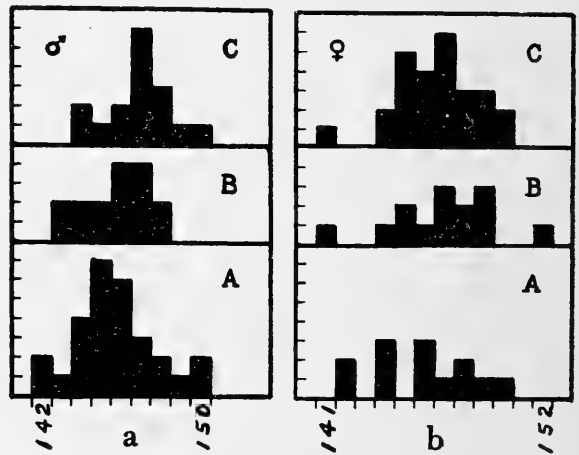
Examination of five other broods of *Natrix s. sipedon* from eastern Ontario and western Quebec, totaling 134 young, resulted in the discovery of 12 with a lateral row of spots (seven from Quebec and five from Ontario) and only 2 specimens (one from Quebec and one from Ontario) that had a lateral stripe. In contrast, only one adult with short lateral stripes, a small male, could be found in the collections of the National Museum of Canada. Dunn (1942) and Inger (1942, 1943) have both shown that the frequency of occurrence of a character in a series of juveniles and adults of the same species may be strikingly different. Their explanation for this is that only the better adapted individuals survive the rigors of natural selection. Their work dealt with the variations in the number of scales and they demonstrated that specimens with atypical scale arrangement were selected against. In the case of these Ontario and Quebec Northern Water Snakes, it is the aberrant pigment pattern of lateral stripes which apparently has a negative survival value. It may be that the normal barred pattern serves to break up the linear body form of young Northern Water Snakes making them inconspicuous whereas the dark lateral stripe adjacent to the pale ventral color only serves to emphasize the body form and thereby makes them more conspicuous to their predators.

There is considerable variation in the number of bars which form complete cross bands in the anterior region of each specimen. This varies from one crossband in specimen No. 41 (deformed, sex not recorded) to 16 complete crossbands in specimen No. 26, a male.

VARIATION IN SCALE COUNTS

The number of ventral scales in the Ottawa litter varies from 142 to 150 for both males and females (Figure 2). In the series of 42 adults the range for 41 of them is from 144 to 150 for both males and females; the remaining specimen, a female, has 141 ventral scales (Figure 2, sample C). In a litter of 30 individuals from Portland, Leeds County, Ontario, the females have 141-152 ventrals and the males, 143-148 (Figure 2, sample B). There is no sexual dimorphism evident here.

FIGURE 2. Ventral scale counts of male (a) and female (b) *Natrix s. sipedon*. Each square represents one individual. Samples A and B are litters from, respectively Ottawa, and Portland, Ontario; sample C consists of adults from Ontario and Quebec.



The number of caudal scales in the Ottawa litter varies from 58 to 71 for females and from 71 to 85 for males (Figure 3,A). Only one male and female have 71 caudals. The range for the 42 adult specimens is not as great and there is no overlap (Figure 3,C). The range for the 30 young Portland is narrow and the sexual dimorphism of the caudal scale count is even more marked (Figure 3,B).

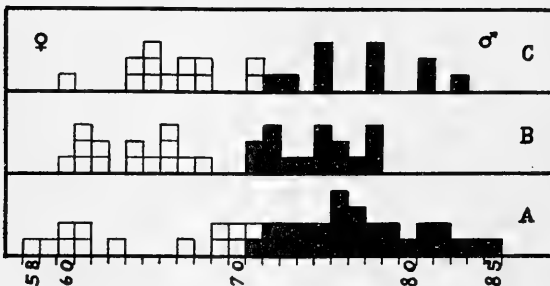


FIGURE 3. Caudal scale counts for male (black squares) and female (open squares) *Natrix s. sipedon* from the Ottawa litter. Note the sexual dimorphism with an overlap (at 71) of only one scale. Samples A, B, and C as in Figure 2.

In the Ottawa litter the scales on the head (labials and oculars) deviate from the usual arrangement in 14 males and in only five females. The higher percentage of males with aberrant scale arrangements (2.8 males: 1 female in contrast to the sex ratio in this Ottawa litter of only 2.1 males: 1 female) is also evident in Martof's paper (1954) on a litter of 85 *Thamnophis s. sirtalis*. In his tables I to IV, there are 46 examples of deviations by males and only 38 examples involving females. There were 42 males and 41 females in this litter.

In the case of lower labials the males show a greater deviation than the females and in the opposite direction, that is towards fewer scales. Eleven females had a count of 10-10, and one had 9-10. There were 15 males with 10-10, 3 with 9-10, 6 with 10-9, and 4 with 9-9. This trend is evident in Martof's Table IV of the lower labial counts for *Thamnophis s. sirtalis* in which seven females and two males with extra scales and three females and 15 males with a reduced number of scales are shown.

When the number of ventrals are plotted against the number of caudals for each specimen in the Ottawa litter, there is apparent a trend in both sexes for high scale counts in ventrals to be correlated with high caudal counts. This is also true of the 30 specimens in the Portland, Ontario, litter. However, what is more interesting, is that the longest specimens (total length) do not have the most ventral or caudal scales (except for the largest male which has the most caudal scales). Similarly the shortest male and female do not have the least number of ventral or caudal scales. In addition the longest specimens, both male and female, do possess the maximum body lengths, and the shortest male and female likewise have the minimum body lengths recorded in the Ottawa litter. There must be, then, many specimens of the same length which do not have the same numbers of scales. An example is male No. 20 and male No. 34, both of which are 155.6 mm in body length, yet No. 20 has 142 ventrals and No. 34 has 150 ventrals. This means that a snake may possess relatively large or small scales in relation to its length. Since the number of ventral scales always coincides with the number of vertebrae, the snakes with larger ventrals have few vertebrae per unit of body length and therefore less flexibility of the vertebral column. Increased flexibility is advantageous to limbless reptiles and Inger (1943) has shown that individual snakes with the reduced number of vertebrae are less likely to survive to maturity.

VARIATIONS IN MEASUREMENTS

The maximum body length of males and females is the same (165.1 mm) but 4 males are smaller (142.9 mm) than the smallest female (149.2 mm). The difference in length between the longest and shortest male is 22.2 mm and that for the females is only 15.9 mm. (Perhaps the larger sample of males accounts for this).

In total length the males are somewhat longer than the females, indicating a longer tail in the males. The difference in length between the longest and shortest male is 38.1 mm and for females is 22.2 mm.

There is, then, a greater degree of variation in tail lengths than in body lengths, especially in the case of the males.

STILLBORN SPECIMENS

One of the stillborn snakes, a female, appears to be normal and has 142 ventrals and 58 caudals. The preoculars number 1-1, the postoculars 3-3, upper labials 8-8, but the lower labials are 9-10.

The second specimen is crinkled its entire length. Its scales are rather evenly hexagonal and very weakly keeled. It has 116 complete ventral scales and 22 incomplete ones, 53 caudal scales (4 not paired), 8 under labials, 10 lower labials, 1 preocular and 3 postoculars.

SUMMARY

(1) A litter of 42 Northern Water Snakes *Natrix sipedon sipedon* from Ottawa, Ontario, was analyzed as to color pattern, scale arrangements, and linear measurements. It was compared with a litter of 30 young from Portland and a series of 42 adults from Ontario and Quebec.

(2) The sex ratio of the Ottawa litter favors the males 2.1:1.

(3) Variation in pigment and scale characters in the Ottawa litter surpasses that found in the adult sample and the litter from Portland.

(4) More males than females have aberrant pigment patterns and scale counts.

(5) Sexual dimorphism is nil in the ventral scale counts but is sharply defined in caudal scale counts.

(6) Specimens of the same body length do not have the same number of ventral scales indicating a parallel difference in the number of vertebrae.

(7) It is concluded from the analysis of this litter of snakes that (a) in taxonomic studies the degree of individual variation in color pattern and in meristic factors within the species should not be underestimated, and that (b) possession of short lateral stripes on juvenile *N. s. sipedon* diminishes their chances of survival to maturity.

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^a NOTES ON FUNGI FROM NORTHERN CANADA
III. AMANITACEAE, HYGROPHORACEAE
RHODOPHYLLACEAE, AND PAXILLACEAE¹

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PREVIOUS papers in this series, by Groves and Hoare (1954) and Groves and Thomson (1955), have dealt mainly with certain groups of larger fungi, collected by members of the biological survey parties operating in the Canadian north under the auspices of the Defence Research Board during the summers of 1948-51. The Agaricales, or mushrooms, comprise the most numerous of the groups of larger fungi and are also the most difficult to identify. Because the number of species of agarics collected is too large to treat conveniently in one paper, it has been decided to adopt the classification proposed by Singer (1951) in which the agarics are divided into a number of families, and it is intended to group certain families and discuss them in separate papers. The grouping for each paper is not intended to indicate relationships but is simply based on convenience with respect to the number of species involved.

AMANITACEAE

Records of Amanitaceae from northern North America appear to be few. Cash (1953) listed *Amanita muscaria*, *Amanitopsis vaginata* var. *livida* and *Pluteus cervinus* as occurring in Alaska. Lange (1955) found *Amanitopsis vaginata* widely distributed in Greenland and also stated that *A. muscaria* was found here by Rosenvinge at Sinigtok, but he failed to find it himself.

Amanita muscaria (L. ex Fr.) Pers. ex Gray Nat. Arr. Brit. Pl. 1:600. 1821.

Agaricus muscarius Fr. Syst. Myc. 1:16. 1821.

This species is well known and not likely to be misidentified with its characteristic stature, color, closely adhering volva, and rather large, oval, nonamyloid spores $9.5-11.5 \times 6.5-8.0 \mu$. One specimen in the Newfoundland collection differed from typical *A. muscaria* in gross appearance and in the opinion of Mrs. Thomson it was probably *A. velatipes* Atk. However, there were no spores in this fruit body and its identification could not be confirmed.

Specimens examined. DAOM 25020, Goose Bay, Labrador. Coll. J. M. Gillett and W. I. Findlay (5923). Aug. 1950. Det. J. W. Groves; DAOM 28509, St. Anthony, Nfld. Coll. D. B. O. Savile and J. Vaillancourt (2802), Aug. 9, 1951. Det. D. B. O. S.

Amanita pantherina (DC. ex Fr.) Secr. Mycogr. Suisse 1:20. 1833.

Agaricus pantherinus Fr. Syst. Myc. 1:16. 1821.

The collection consists of one fruit body very much shriveled. The pileus is about 4.5 cm in diameter, brown with white warts, and the stipe about 7 cm long with bulbous base. The annulus is superior, floccose-membranous and slightly yellowish. The spores are ellipsoid and nonamyloid, $8.0-11.0 \times 6.5-8.0 \mu$.

Specimen examined. DAOM 48918, Canol Rd., Mile 222, Ross R. Valley near north end of Sheldon L., Yukon. Coll. A. E. Porsild and A. J. Breitung, Aug. 8, 1944. Det. Sheila C. Thomson.

¹Contribution No. 1649 from the Botany and Plant Pathology Division, Science Service, Canada Department of Agriculture, Ottawa, Ontario.

Amanita velatipes Atk. Studies of Amer.. Fung. p. 63, 1903.

This species was described by Atkinson based on specimens collected near Ithaca, N.Y., but does not seem to have been recognized by other authors. Specimens collected at Cantley, Que., were compared with the type by Mrs. Thomson through the kindness of Dr. R. P. Korf. It is a large species, reaching or exceeding the size of *A. muscaria* and might be mistaken for faded specimens of this species, but it is more fragile in consistency and has a volva tightly enclosing the bulb of the stem and forming a narrow, free collar. The spores are ovoid to ellipsoid and nonamyloid. It might be confused with *A. cothurnata* because of the type of volva, but the latter has a smaller stature with white fruit body and more globose spores.

Two of the northern collections have been referred to this species by Mrs. Thomson. Collector's notes on the fresh plant of the Labrador collection are as follows: "Pileus 12-15 cm, 0.5-1 cm thick, orange, smooth with small fibrous flecks. Lamellae white. Veil present, delicate. Stipe cream-colored, scaly, 15-20 cm high. Volva present." The dried specimen is about 8 cm broad, yellowish, with numerous whitish warts on the pileus, margin striate, stipe white, bulbous, 14 cm high, 1.2 cm thick, volva close with narrow free collar, spores nonamyloid, $9-11.5 \times 6-8 \mu$.

The Newfoundland collection consists of one broken fruit body, cream to yellowish with whitish scales on the pileus, stipe with a tapering bulb, volva close with free collar, spores nonamyloid $10-11.5 \times 6.5-8 \mu$. Savile suggested that it was *A. cothurnata* in his field notes.

Specimens examined. DAOM 25026, Goose Bay, Labrador, Coll. J. M. Gillett and W. I. Findlay (5598); Aug. 4, 1950. Det. S. C. T.; DAOM 28503, St. Anthony, Nfld. Coll. D. B. O. Savile and J. B. Wallis (2491), July 23, 1951, Det. S. C. T.

Amanitopsis fulva (Fr.) Fayod Ann. Sci. Nat. Ser. 7, 9:317. 1889.

Agaricus vaginatus e Fr. Syst. Myc. 1:14. 1821.

Amanitopsis vaginata var. *fulva* Sacc. Syll. Fung. 5:21. 1887.

This common and widely distributed fungus has been reported from Alaska by Cash (1953) and two collections were found among the material examined.

The species included in *Amanitopsis* are very similar to *Amanita* except that they lack an annulus. Many authors include them in *Amanita* and Singer (1951) reported finding a specimen of *A. fulva* growing in hard gravelly soil that did have an annulus and he suggested that the development of the annulus was a response to pressure and of no taxonomic value at the generic level or under certain conditions even at the specific level.

Specimens examined. DAOM 21736, Great Whale River, Que. Coll. J. R. Vockeroth, July 17, 1949. Det. J. W. G.; DAOM 28546, St. Anthony, Nfld. Coll. D. B. O. Savile and J. Vaillancourt (2908), Aug. 16, 1951. Det. J. W. G.

Amanitopsis vaginata (Fr.) Karst. Hattsv. 1:6. 1879.

Agaricus vaginatus b Fr. Syst. Myc. 1:14. 1821.

There are three well-known and easily recognized taxa belonging in *Amanitopsis* which have been variously interpreted as forms, varieties, or subspecies of *A. vaginata*, or recognized as autonomous species. They are distinguished principally by the color, tawny brown, mouse-gray, or white, and have been known as var. *fulva*, var. *livida*, and var. *alba*, respectively. The

tendency at present seems to be to regard them as distinct species and they are so treated here. Following Lange (1935) and Kühner and Romagnesi (1953) the gray form is taken as the type form for the name *A. vaginata*.

Five collections, each consisting of a single fruit body, were among the material examined.

Specimens examined. DAOM 27658, Icy Arm, Clyde Fjord, Baffin Island, N.W.T. Coll. V. C. Wynne-Edwards, Aug. 5, 1950. Det. S. C. T.; DAOM 27900, Baffin Island, N.W.T. Coll. V. C. Wynne-Edwards, July 31, 1950. Det. S. C. T.; DAOM 44996, Quebec—Labrador height of land, 58° 06' N, 68° 25' W, elev. 1700 ft, Coll. J. M. Gillett (8997), Aug. 15, 1954. Det. J. W. G.; DAOM 44999, Crater L., 60 miles SW of Saglek, Labrador, elev. 2000 ft, Coll. J. M. Gillett (8800), 1954. Det. J. W. G.; DAOM 45001, Crater L., 58 miles SW of Saglek, Labrador, Coll. J. M. Gillett (8964), Aug. 11, 1954, Det. J. W. G.

Amanitopsis inaurata (Secr.) Fayod Ann. Sci. Nat. Ser. 7, 9:317. 1889.

Agaricus strangulatus Fr. Epicr. Syst. Myc. p. 6. 1836-1838.

Agaricus strangulatus Fr. Epicr. Syst. Myc. p. 6. 1836-1838.

Amanita strangulata Quél. Champ. Jura et Vosges. 1:66. 1872.

Amanitopsis strangulata Karst. Hattsvamp. p. 7. 1879.

This species is characterized by the gray volva which tears in such a way as to leave patches adhering to the pileus as gray scales and also forms sub-annular zones on the lower part of the stipe. The pileus is dark gray-brown, sometimes nearly black when young. The larger spores will separate it from *A. vaginata*. In *A. inaurata* they are (9) 10-12 (14) μ in diameter and in *A. vaginata* they are 8-10 μ in diameter.

Specimens examined. DAOM 21855, W of Dawson, Yukon, Coll. L. G. Billard and J. A. Calder (4532), Aug. 14, 1949. Det. J. W. G.; DAOM 25878, Chesterfield Inlet, Keew., N.W.T. Coll. D. B. O. Savile (1427), Aug. 14, 1950, Det. J. W. G.; DAOM 45068, Upper N. Hebron valley, 55 miles SW of Saglek, Labrador, Coll. J. M. Gillett (8991), Aug. 14, 1954. Det. S. C. T.; DAOM 45069, Quebec—Labrador height of land, 58° 06' N, 64° 25' W, elev. 1700 ft, Coll. J. M. Gillett (8995), Aug. 15, 1954. Det. S. C. T.; DAOM 45070, Upper N. Hebron valley, 50 miles SW of Saglek, Labrador, Coll. J. M. Gillett (8989), Aug. 14, 1954, Det. S. C. T.

Pluteus cervinus (Schaeff. ex Fr.) Quél. Champ. Jura et Vosges p. 115. 1872.

Agaricus cervinus Fr. Epicrisis Syst. Mycol. p. 140. 1836-1838.

This well-known species is common and widely distributed. It was reported from Alaska by Cash (1953). Five collections with a total of eight fruit bodies were among the northern collections examined.

Specimens examined. DAOM 21938, Moosehide Mt., Dawson, Yukon, Coll. L. G. Billard and J. A. Calder (3799), July 19, 1949, Det. J. W. G.; DAOM 25198, Fort Smith, N.W.T., Coll. C. C. Loan (L225), Aug. 13, 1950, Det. J. W. G.; DAOM 25865, Fort Smith, N.W.T., Coll. C. C. Loan (L235, Aug. 15, 1950, Det. S. C. T.; DAOM 25870, Fort Smith, N.W.T., Coll. C. C. Loan (L221), Aug. 13, 1950, Det. S. C. T.; DAOM 26125, Fort Smith, N.W.T., Coll. C. C. Loan (L222), Aug. 13, 1950, Det. J. W. G.

Pluteus chrysophlebius (Berk. & Rav.) Sacc. Syll. Fung. 5:678. 1887.

Agaricus chrysophlebius Berk. & Rav. Ann. Mag. Nat. Hist. III, 4:289. 1859.

Pluteus admirabilis Peck. N.Y. St. Mus. Rep. 24:64. 1872.

The collection consists of one specimen which in the dried condition is 2.5 cm broad, rugose, yellow, with stipe 3 cm long and 2 mm thick, yellow. The spores are almost globose, 6.5-8 \times 5-6.5 μ . A few vesiculose cystidia are present.

This fungus has been better known in North American literature as *Pluteus admirabilis* (Peck) Peck, but Singer (1956) has claimed that *P. admirabilis* is a synonym of the older name *P. chrysophlebius*.

Specimen examined. DAOM 28052, Fort Smith, N.W.T., Coll. C. C. Loan (L223), Aug. 13, 1950, Det. S. C. T.

Volvariella speciosa (Fr.) Sing. Lilloa 22:401. 1951.

Agaricus speciosus Fr. Syst. Myc. 1:278. 1821.

There was one specimen consisting of a fruit body collected in sawdust. The spores are ovoid, $15-19 \times 8.5-11 \mu$. The identification has been checked by Dr. R. L. Shaffer.

Specimen examined. DAOM 21732, Dawson, Yukon. Coll. L. G. Billard and J. A. Calder (3709), July 14, 1949. Det. J. W. G.

HYGROPHORACEAE

The genus *Hygrophorus* has usually been divided into three sections, *Limacium*, *Camarophyllus*, and *Hygrocybe*. Some authors have raised these sections to the rank of genera and this has been done by Singer (1951) in recognizing the Hygrophoraceae as a family. However, for our purposes all the species are referred to *Hygrophorus*.

Several species of *Hygrophorus* have already been reported from far northern territories. Dearness (1923) reported *H. cantharellus* (Schw.) Fr. from Camden Bay and an unidentified species from Bernard Harbour, N.W.T. Linder (1947) reported *H. miniatus* Fr. from Burwell, N. Labrador. Saccardo, Peck and Trelease (1904) reported *H. limacinus* Fr. from Alaska, and Cash (1953) added *H. ceraceus* Fr., *H. laetus* Fr. and *H. conicus* Fr. in her list of Alaskan fungi. Lange (1955) collected *H. pratensis* Fr., *H. turundus* Fr., *H. coccineus* Fr., *H. marchii* Bres., *H. vitellinus* Fr. sensu Möller, *H. violeipes* Lange, and another unidentified species in Greenland.

Five species were identified among the Canadian collections, all of which belong in the section *Hygrocybe*.

Hygrophorus cantharellus (Schw.) Fr. Epicr. Syst. Mycol. p. 329. 2836-1838.

Agaricus cantharellus Schw. Naturf. Gesell. Leipzig Schrift 1:88. 1822.

The single collection consists of several small fruit bodies considerably broken up. They are reddish orange, and furfuraceous-squamulose with yellowish, decurrent lamellae. The spores are $9.5-10.5 \times 5-6.5 \mu$.

Specimen examined. DAOM 26868, St. Anthony, Nfld. in sphagnum, Coll. D. B. O. Savile and J. Vaillancourt (2520), July 24, 1951. Det. J. W. G.

Hygrophorus conicus (Fr.) Fr. Epicr. Syst. Myc. 331. 1836-1838.

Agaricus conicus Fr. Syst. Myc. 1:103. 1821.

This species is easily recognized by the conical pileus and blackening flesh. The spores are $9-12 \times 5.7 \mu$.

Specimens examined. DAOM 21848, Moosehide Mt., Dawson, Yukon, Coll. L. G. Billard and J. A. Calder (3212), June 21, 1949, Det. J. W. G.; DAOM 21866, West Dawson, Yukon, Coll. W. W. Judd, 1949, Det. J. W. G.; DAOM 21872, Dawson, Yukon, Coll. J. A. Calder and L. G. Billard (3197), June 21, 1949, Det. J. W. G.; DAOM 25877, Gillam, Man., Coll. W. B. Schofield (1071), July 10, 1950, Det. J. W. G.; DAOM 28537, St. Anthony, Nfld., Coll. D. B. O. Savile and J. Vaillancourt (2812), Aug. 9, 1951, Det. J. W. G.

Hygrophorus miniatus Fr. var. *sphagnophilus* Peck N.Y. St. Mus. Bull. 116:61. 1907.

There is some doubt concerning the identity of this species. Lange (1955) thinks it is the fungus he reported as *H. turundus* Fr. and suggests that

H. cantharellus reported by Dearness (1923) may be the same species. Smith and Hesler (1942) use the name *H. turundus* Fr. for a fungus that seems to be closer to *H. cantharellus*. The collection referred here seems sufficiently distinct from *H. cantharellus* but might well be the same fungus that Lange called *H. turundus*. The spore size $10-13 \times 6.5-8 \mu$ agrees very well with the measurements given by Lange.

Specimen examined. DAOM 28523, St. Anthony, Nfld., Coll. D. B. O. Savile and J. Vaillancourt (2856), Aug. 12, 1951. Det. S. C. T.

Hygrophorus nitidus Berk. & Curt. Ann. Mag. Nat. Hist. II, 12:424. 1953.

This species is characterized by the waxy yellow color, soon fading to whitish, the umbilicate pileus and long decurrent lamellae. The spores are $6.5-8 \times 3-4 \mu$. Smith and Hesler (1942) consider it to be a synonym of *H. vitellinus* Fr., but Lange (1955) appears doubtful and the plants figured by him as *H. vitellinus* do not have the characteristic umbilicate pileus of *H. nitidus*.

Specimen examined. DAOM 28536, St. Anthony, Nfld., Coll. D. B. O. Savile and J. Vaillancourt (2878), Aug. 14, 1951, Det. S. C. T.

Hygrophorus puniceus (Fr.) Fr. Epicr. Syst. Myc. 331. 1836-1838.

Agaricus puniceus Fr. Syst. Myc. 1:104. 1821.

From the discussion by Smith and Hesler (1942) it is evident that this species and *H. coccineus* Fr. sensu Ricken have been frequently confused and are difficult to distinguish. The chief distinguishing character is the presence of a viscid pellicle in *H. puniceus* and its absence in *H. coccineus*. Lange (1955) stated that this pellicle was absent in the specimen he referred to *H. coccineus* but the specimens collected by Savile have a distinctly viscid pellicle. The spores are $8-10 \times 5-6 \mu$.

Specimen examined. DAOM 21847, Great Whale River, Que., Coll. D. B. O. Savile, July 27, 1949, Det. J. W. G.

RHODOPHYLLACEAE

The family Rhodophyllaceae includes the mushrooms with pink, angular spores. Formerly a number of genera were recognized in this group such as *Entoloma*, *Leptonia*, *Nolanea*, *Eccilia*, and *Clitopilus*, but the modern tendency appears to be to reserve *Clitopilus* for those species with longitudinally striate spores and group the remaining *Clitopilus* species and those of the other genera under the generic name *Rhodophyllum*. The species in this group are difficult to identify and are not well known.

Three of the northern collections have been identified as species of *Entoloma* and since there seems to be some doubt as yet regarding the legitimacy of the name *Rhodophyllum*, the genus *Entoloma* is retained here.

Entoloma griseum Peck Bull. N.Y. St. Mus. 75:14. 1904.

The collection consists of eight fruit bodies about 3-9 cm broad according to the collector's notes. The largest one in the dried material is now 5.5 cm. They were described as light to dark tan and the dried material agrees very well with specimens in DAOM 16838 from Tourville, Que. det. by A. H. Smith. The spores are pink, tuberculate-angular, spheroid, $8-9 (10) \times 7.5-8 (9) \mu$.

Specimen examined. DAOM 28950, St. Anthony, Nfld., Coll. D. B. O. Savile (2958), Aug. 22, 1951. Det. S. C. T.

Entoloma strictius (Peck) Sacc. Syll. Fung. 5:698. 1887.

Agaricus strictius Peck Ann. Rep. N.Y. St. Mus. 23:88. 1869.

Two collections, both from St. Anthony, Nfld., appear to be this species. The large, elongated-angular spores, often with a curving apiculus seem to be characteristic and in this and other respects they agree well with specimens in DAOM 17414 from the Petawawa Forest Experiment Station, Ont., determined by A. H. Smith. The spores measure (8) 10-12 (13.5) \times 6-9 μ .

Specimens examined. DAOM 28972, St. Anthony, Nfld. Coll. D. B. O. Savile and J. Vaillancourt (1929), June 24, 1951, Det. S. C. T.; DAOM 28973, St. Anthony, Nfld., Coll. D. B. O. Savile and J. Vaillancourt (2049), July 4, 1951, Det. S. C. T.

PAXILLACEAE

Paxillus involutus (Batsch ex Fr.) Fr. Gen. Hym. 8. 1836.

Agaricus involutus Fr. Syst. Myc. 1:271. 1821.

There was one collection of this common and easily recognized species. Together with *P. panuoides* (Fr. ex Fr.) Fr. it was listed from Alaska by Cash (1953), and Singer (1951) stated that it was known in both eastern and western hemispheres from the subarctic to the subantarctic regions.

Specimen examined. DAOM 21735, Dawson, Yukon, Coll. L. G. Billard and J. A. Calder (3420), 1949, Det. J. W. G.

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PRESENT DISTRIBUTION AND POPULATION OF THE STARLING IN NEWFOUNDLAND

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SINCE Starlings (*Sturnus vulgaris vulgaris*) reached Ontario some 40 years ago (Lewis, 1954), they have spread across the continent, being recently recorded from Churchill (Beckett, 1953), Fort McKenzie (Bleakney, 1953), Fort Smith (Fuller, 1955), and Vancouver Island (Pearse, 1953). On August 26, 1955, I observed a total of 37, mostly juveniles, at the Air Base at Goose Bay, Labrador. Goose Bay may be a recently established outpost for the species, as Wynne-Edwards (1956) did not record it at that locality during the summer of 1953. It is possible that Starlings also breed at or near Davis Inlet, 180 miles due north of Goose Bay. Mr. Roy Hammond, depot manager, reported Starlings at Davis Inlet during the summers of 1955 and 1956.

The success of the species in those outposts is but another indication of its ability to survive and increase in new and sometimes hostile territory. The purpose of this paper is to document the spread of the Starling in Newfoundland, an island which has many subarctic features.

The Starling was first recorded in Newfoundland on June 9, 1943, when a female was collected near Tompkins, on the west coast of the island. Another Starling was seen in that locality at the same time (Peters and Burleigh, 1945). The female collected had a distinct brood patch and had apparently bred (Peters, in a letter). Peters and Burleigh carried out extensive field work on the island of Newfoundland during the subsequent four years but recorded only a flock of some 25 from January 10 to February 10, 1947, at St. John's, and two individuals near Doyles (in the vicinity of Tompkins) on May 15, 1947. In addition, A. W. Cameron, National Museum of Canada, located a nest in a dead poplar at South Brook (in the vicinity of Tompkins) on July 2, 1949, and a flock of adults and juveniles in that locality on August 7, 1949 (Peters and Burleigh, 1951).

Thus it appears that up to 1949 Starlings were known to breed only on the west coast of the island and to winter in small numbers at St. John's (on the southeast coast) and were nowhere common.

Since 1949, I have kept regular records of the occurrence of this species in new localities in Newfoundland and have recorded its gradual spread. This paper is based on those records and on valuable observations by members of the Natural History Society of Newfoundland.

DISTRIBUTION AND SPREAD

The distribution and spread of Starlings on the island of Newfoundland is summarized below and illustrated in the accompanying map (Figure 1):

West coast

- 1950. Bred at Tompkins and Doyles.
- 1952. Bred at Cormack in the Humber Valley.
- 1953. Bred at St. George's and Stephenville.
- 1954. Bred at Deer Lake and Corner Brook.
- 1955. Bred at Humbermouth.

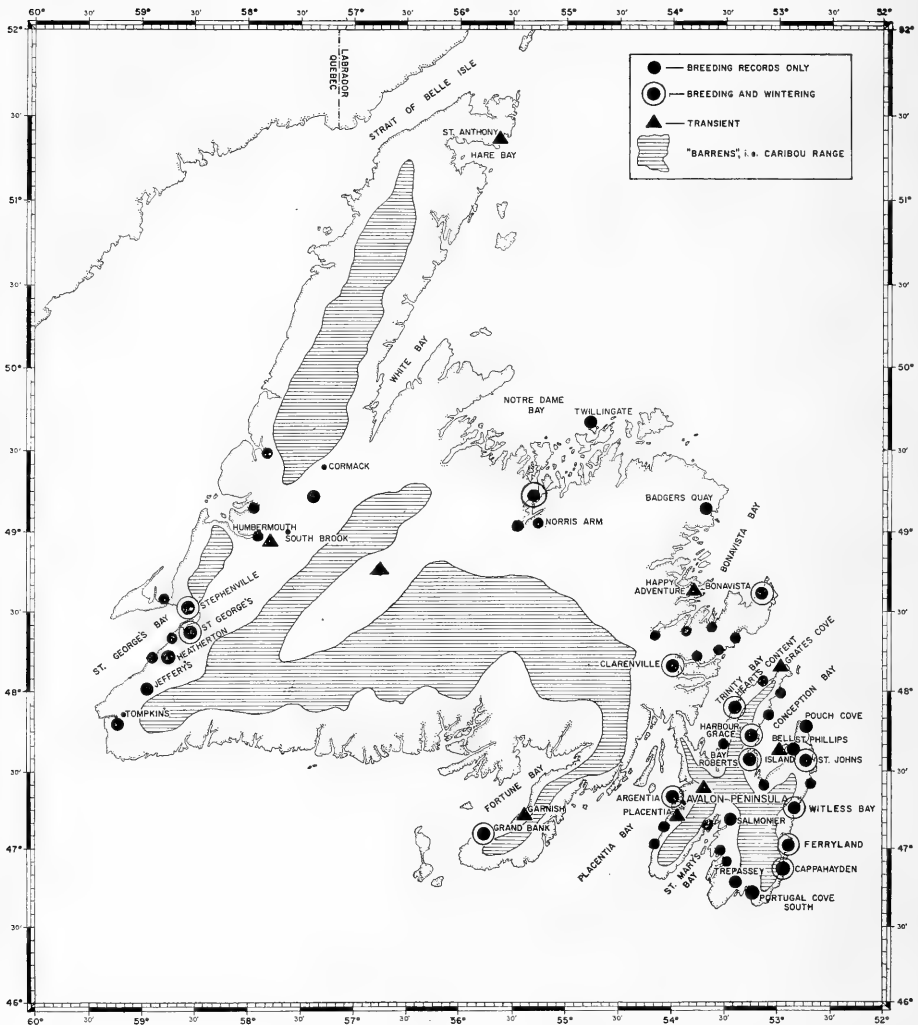


FIGURE 1. Present distribution of the Starling in Newfoundland.

1956. At least 1,000 square miles extending from St. Andrews to Bonne Bay occupied.

Notre Dame Bay

1950. A single bird captured in a pigeon cote at Norris Arm on May 15.

1951. Six, including juveniles, at Benton on August 22.

1952. Bred at Norris Arm and at Twillingate.

1953. Bred at Lewisporte.

1954. Possibly bred at Botwood.

1955. Bred at Botwood. A flock of 210 recorded at Botwood on January 2, 1956.

1956. Reported to be spreading in the Twillingate area.

Bonavista Bay

- 1950. A small flock reported from Badger's Quay in February.
- 1951. Small flocks reported overwintering at Bonavista but no proved breeding. A flock of 19, including juveniles, observed at Badger's Quay on July 16.
- 1952. Bred at Bonavista.
- 1954. A flock of 11 at Happy Adventure in February and March.
- 1955. Bred at Musgravetown, Lethbridge, and Southern Bay.
- 1956. Localities mentioned above extended. About 100 square miles of coastal localities now occupied.

Trinity Bay

- 1952. A flock of 40 recorded at Clarenville from December 1952 to late spring 1953.
- 1953. Bred at Heart's Content and possibly at Clarenville.
- 1954. Bred at Clarenville and Shoal Harbour.
- 1955. Bred at Milton, George's Brook, and Port Rexton.

Fortune Bay

- 1950. A flock of 41 at Garnish on November 11.
- 1951. Bred at Garnish and Grand Bank.
- 1954. Bred at Fortune.

Avalon Peninsula

- 1950. Bred at several farms in the vicinity of St. John's and at the Air Force Base, Fort Pepperrell. A flock of 240 counted at St. John's on December 2.
- 1951. Bred at Witless Bay about 20 miles from St. John's on the Southern Shore. Winter count at St. John's on December 26, 1951, was 610.
- 1952. Increasing in the St. John's area. A flock wintered at Trepassey on the Southern Shore, some 60 miles from St. John's. Count at St. John's on January 3, 1953, was 800.
- 1953. Increasing in the St. John's area. Bred at Ferryland and Trepassey on the Southern Shore, at Bay Roberts and Harbour Grace in Conception Bay, and at Placentia Bay.
- 1954. No new breeding localities known but small flocks wintered at Whitbourne and a flock of 900 recorded at Belle Island on November 18.
- 1955. Now breeding in the business section of the city of St. John's and along the Southern Shore as well as at most settlements in Conception Bay.
- 1956. Nearly all the coastline of the Avalon Peninsula now occupied.

Up to the end of 1949, six years after the first Starling was recorded in the island of Newfoundland, the species had not been recorded outside the Tompkins area on the west coast and the St. John's area on the east coast. The first evidence of migration from those two points was in the following year (1950) when a single bird was recorded at Norris Arm on Notre Dame Bay, a small flock at Badger's Quay on Bonavista Bay, and a fairly large flock (41) at Garnish on Fortune Bay. In 1952, Starlings bred at those three localities and had extended their breeding range to Twillingate (an outer island) in Notre Dame Bay and to the town of Bonavista on Bonavista Bay. In 1952, also, the Starlings had increased on the Avalon Peninsula, spreading coastwise, and for the first time were recorded breeding outside the Codroy Valley on the

west coast of the peninsula. Nearly as spectacular at migration was recorded in 1953. In that year, Starlings bred at Placentia in Placentia Bay, at several localities in Conception Bay and at Heart's Content in Trinity Bay. Thus by the summer of 1953 Starlings were breeding on all sides of the Avalon Peninsula.

More than half the human population of Newfoundland resides on the Avalon Peninsula and there are many farms and pasture lands which are attractive to Starlings and can support them. Starlings were first recorded breeding in the vicinity of St. John's in 1950 but it is almost certain that they had been doing so undetected for several years previously. The first immigration from St. John's was noticeable in 1951 when Starlings bred at Witless Bay on the Southern Shore, some 20 miles from St. John's. Within the next two years they gradually spread along the southern shore and had reached Trepassey some 100 miles from St. John's. In 1953, also, as recorded above, they had settled at localities in Conception Bay, Trinity Bay, and Placentia Bay. By the end of 1956, they were breeding at all the larger settlements along the coast of the Avalon Peninsula and at many of the smaller ones; in all, some 700 lineal miles of coastline were occupied.

In general, Starlings appear to avoid the interior of the island which may, except for Gander Valley, be described as mainly subalpine in character (map, Figure 1). Persons who know the species well have watched in vain for them at the larger inland towns such as Gander, Badger, and Grand Falls. However, I saw a pair at Buchan's on April 26, 1955, but could not determine whether they were breeding or transient.

The only coastal areas in Newfoundland from which Starlings are now absent are some 150 lineal miles of the south coast and all the northern peninsula. That there is prospecting in the northern peninsula is already evident. Mr. Melvin McNeil recorded a single Starling at St. Anthony on May 1, 1954, and he has since reported that in 1957 a pair of Starlings nested in a crevice under the eaves of an old building at St. Anthony.

NESTING

Nests examined at Ferryland, Badger's Quay, and Twillingate were situated in the walls of old buildings and in or under fishing stages. In St. John's, which is the oldest city in North America, most of the buildings are constructed of wood and a large number are very old. There, Starlings have found ideal nesting sites under the eaves and in the walls of some of those buildings. Loose bricks in the walls of some of the warehouses have provided additional nesting sites in the main part of the business section. Starlings are now nesting on Water Street, Duckworth Street, and Gower Street in the business section as well as on all the old residential streets.

Along the coast, Starlings are nesting in old abandoned buildings or in the more dilapidated fishing premises, and especially under fishing flakes, which are elevated wood structures for drying fish.

Perhaps the most unusual nesting sites are (or were) provided at the air

force base, Fort Pepperrell, near St. John's. Many of the buildings there have ventilation holes under the eaves of the roofs. These vents are about $2\frac{1}{2}$ inches in diameter and six feet apart. On a visit there in the spring of 1954, I noticed that several Starlings were carrying nesting material into the vents. On inquiry on May 9, 1957, I learned from the authorities at the base that Starlings were using the vents so much that the accumulated nesting material on the rafters under the roofs constituted a serious fire hazard. Workmen were then in the process of screening all the vents to prevent Starlings from nesting in the buildings. Thus, within seven years from its first reported nesting in the St. John's area, the Starling had become a nuisance.

POPULATIONS

As the map will show, Starlings overwinter at all the larger centers of population. Small flocks also may be encountered almost anywhere along the coast in winter, especially on the Avalon Peninsula. The pattern of colonization is very consistent. Small flocks appear at a new area in the winter and breed that spring, or at least the following spring.

The Starlings on the west coast appear to retreat slightly westward in the winter to the St. George's Bay coast, especially to Stephenville and St. George's. No winter counts have been obtained from those localities but approximately 300 were recorded at Humbermouth in mid-December 1954.

St. John's has remained the most important locality for wintering concentrations. This may be explained partly because the area is milder in winter and there is less snowfall than in most other sections of the island (Hare, 1954). Apart from usually snow-free fields, the Starlings have an additional source of food at St. John's in the berries of the mountain ash (*Sorbus americanus*) which remain on the trees late in the winter. Those trees are rather common ornamentals in the suburbs of the city and have helped to support a wintering population of Robins (*Turdus migratorius*). The first evidence of competition between Starlings and Robins was recorded during the winter of 1956-57. The 1956 crop of mountain ash berries was a poor one. Starlings and Robins together had finished the entire supply by late December. Early in January seven Robins were examined by me; all of them had died of starvation. No Robins were seen at St. John's that winter after January 20, 1957; that had not happened since 1936.

The following are high counts of Starlings at the city of St. John's:

December 2, 1950	240
December 26, 1951	610
January 3, 1953	800
February 12, 1954	1,000
December 27, 1954	1,545
December 23, 1955	1,600
December 26, 1956	847

It will be noted from the above that the city of St. John's can support only a small wintering population of Starlings and that the population may vary with the winter conditions.

The sole attempt to estimate the total wintering population was in 1954,

when in late December, 2,245 Starlings were reported from various areas, including 1,545 at St. John's. The areas reported from were less than half those which were known to be occupied by Starlings in the summer. The Christmas count at St. John's (847) in 1956 was the lowest in three years; but that December was an exceedingly cold one and Starlings had spread out in small groups along the coast. On October 27, 1956, a single flock estimated at 2,300 at St. John's was the largest flock recorded so far.

Some idea of the spread of Starlings in the island of Newfoundland since 1949 may be obtained from the fact that by 1956 they were breeding in at least 2,000 square miles of the island.

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NOTES

Observation of a Short-tailed Weasel Capturing a Chipmunk

ON May 5, 1954, near Springbank Bridge on the Madawaska River in Renfrew County a short-tailed weasel *Mustela erminea cicognanii* was observed as it leisurely crossed a logging road. I watched it search around a large moss-covered log and then disappear in the woods. In a few minutes, one hundred and fifty feet in the direction that the weasel appeared to be traveling my attention was attracted by the noise of the claws of two small animals as they spiraled in close pursuit up a large elm tree, moving much too rapidly for easy identification. The pursued animal on reaching the topmost branches unhesitatingly leaped to the ground. When the pursuing animal halted and then slowly

descended the tree I could see that it was a weasel.

Without moving from my standing position I noticed a chipmunk pass on the ground about twenty feet away and then start to rapidly climb another large elm tree. I suspected this to be the pursued animal that had jumped from a treetop a few minutes before. It appeared to be in haste, steadily climbing until it got into the top of the tree and out onto one of the smallest twigs there to hunch itself into a roundish spot against the sky. The trees were bare of leaves at this date.

The chipmunk was already settled in the treetop before a weasel appeared on the same general course as the chipmunk had taken. The weasel slowly meandered to the base of the tree and started to ascend.

The tree was a typical, many-branched American elm about fifteen inches in diameter at the butt. Several times in ascending the lower and larger branches the weasel followed a branch that did not carry the chipmunk but it never went more than a few feet before it would retrace to pick up again the chipmunk's course. In the upper portion of the tree where the branches were much smaller in diameter the weasel became sure of the trail making no errors in going directly to the site of the chipmunk. The chipmunk allowed the weasel a distance of about three feet when it jumped clear, landing hard on its belly in the old leaves. It lay motionless, momentarily, appearing to be stunned. I was tempted to go over and pick it up if possible but did not move from my original position of observation.

Again the weasel retraced its course down the tree in the same leisurely manner. When it reached the main trunk of the tree the chipmunk began to move and slowly made its way to another large tree on the other side of where I stood. It passed close to me and the weasel came within a yard of my feet, rose on its hind legs and looked me over to the top of my head. I could plainly see the twitching of its nostrils as it paused to make this inspection. It continued on the trail. By this time the chipmunk had reached the base of the tree but had not ascended three feet when the weasel in a few undulating leaps reached the tree and very quickly spiraled up the trunk in pursuit of its victim. The chipmunk was about twelve feet from the ground when the weasel seized it; both fell and rolled together on the ground. The chipmunk gave one short squeal and became rigid. The weasel holding its head high, easily carried the curled chipmunk some distance over rough ground to take shelter under a pile of logs.

Dr. Norman Guiou was also a witness to this incident.

ROWLEY FRITH

65 Acacia Avenue
Ottawa 2, Ontario
24 July 1957

Observations of the Mocking-bird in Eastern Ontario

ON May 29, 1957, while driving with Dr. and Mrs. Norman Guiou and Mrs. Frith near the point where the Stewartville side road joins Highway 17 in Renfrew County (about ten miles west of Arnprior), I stopped the car within forty feet of a Mockingbird *Mimus polyglottos* which was perched on a wire fence. During the period of our observation which lasted more than ten minutes the bird was quite active making frequent short flights to the ground and to nearby brush piles in search of food. Dr. Guiou approached it on foot sometimes within thirty feet as it made short erratic flights along the fence. During our observations this bird remained silent.

On June 9, 1957, the same group as mentioned above observed at the southeasterly corner of Torbolton Township, Carleton County (about three miles southwest of Dunrobin) a singing Mockingbird perched on the high transmission wires of a powerline. This bird when approached would move along the powerline or to tall trees of the vicinity and seemed cautious to keep a distance of roughly two hundred feet between it and its observers who were each equipped with binoculars. During the period of observation, exceeding fifteen minutes, this bird sang intermittently and was heard to clearly imitate several species of the vicinity: Crested Flycatcher, Robin, Catbird, Rose-breasted Grosbeak, Brown Thrasher and probably others. On one occasion it was observed to continue its song while in flight.

ROWLEY FRITH

65 Acacia Avenue
Ottawa 2, Ontario
24 July 1957

Cedar Waxwings at Churchill Manitoba

ON June 26, 1957, I had a long and careful observation of two Cedar Waxwings here. Waxwings are rare in the Churchill

area and any that I had previously seen here were Bohemian Waxwings. When I first saw these two, they were feeding among some weed stalks at the foot of my yard. Later they flitted about among other plants and bushes in the yard, and eventually perched in plain view, one on an aerial wire about 18 feet from my point of observation, and the other on the top of a pole a little farther distant. The light was excellent and with my field glasses I was able to clearly note every feature of identification. I had them under observation for a full half-hour.

EVA BECKETT

Churchill, Manitoba

9 September 1957

Distribution of the Harvest Mouse in British Columbia

IN MAY 1942 Mr. George P. Holland trapped two harvest mice *Reithrodontomys megalotis* in the southern Okanagan Valley, British Columbia, one at Osoyoos Lake and one near the end of Dog Lake, which is about 29 miles north of Osoyoos Lake. These captures represent the first Canadian records for the species (Holland, 1942). Subsequent trapping in the region produced only a few additional specimens: two at Osoyoos Lake taken by Dr. G. C. Carl in 1944, another on October 13, 1949, and two half-grown young at Vaseaux Lake, 22 miles to the north, on October 13, 1947. The last three were taken by myself in snap traps. These are the only records from the southern Okanagan Valley known to me.

Dog Lake continued to represent the most northerly station until May 1956, when I trapped six adult specimens near Okanagan Landing, five at the tree line on the shore of Okanagan Lake, one on open grassland 200 feet above and 300 yards east of the lake, a habitat occupied also by the pocket mouse *Perognathus parvus* and meadow mouse *Microtus montanus*. During September 1957 I trapped two additional specimens in

heavy roadside weed growth two miles to the north.

The question of whether this series of captures indicates a recent invasion of harvest mice or if, on the other hand, the species had remained undetected until Holland captured specimens in 1942 is probably impossible to answer. To support the invasion theory there are reports of trapping in the lower Okanagan region in earlier years. William Spreadborough in 1905 (R. M. Anderson, 1932), Anderson and Garrett in 1913 (E. M. Anderson, 1915), myself in 1930 and 1931, and subsequently others failed to capture the species. That a harvest mouse population may have expanded rapidly northward through the valley bottom of the lower Okanagan, where suitable habitat is continuous or nearly so, seems likely enough, but its sudden appearance at Okanagan Landing is not so likely. From the north end of Dog Lake, by the most direct land route and ignoring all physical obstacles, the distance is some 54 miles. So also the intervening habitat is largely unsuited to this animal's needs. It is difficult to conceive of the small, delicate harvest mouse moving so great a distance in so short a time, even though a number of generations might be involved. On the other hand these particular areas at Okanagan Landing have been trapped at intervals since 1911. The harvest mouse is easily trapped and had it been present it seems doubtful that none would have been taken. And so the question remains unanswered.

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- JAMES A. MUNRO
Okanagan Landing
British Columbia
13 September 1957

Impaction of the Gullet of a Starling with a Lepidopteran Pupal Case



FIGURE 1. Pupal case fragment in throat of Starling.

Insert: Pupal case fragment removed.

SIXTY-FOUR Starlings *Sturnus vulgaris* L. (46 males, 17 females, one unsexed) were found dead on 21 March 1957 in a city park in Hamilton, Ontario, by Mr. V. Bruce Collins of this department. One of the Starlings, a male, was observed to have a swelling in the throat region. When the area was laid open, the posterior sixth of a lepidopteran pupal case was found blocking the upper end of the esophagus (Figure 1). Autopsy revealed that the crop was empty and normal in appearance; the intestine contained fragments of one or more tapeworms, two nematodes, and possibly the partially digested remains of a part of the lepidopteran pupa. Identification of the lepidopteran involved is not certain, but the fragment of the pupal case resembles in size and appearance the posterior end of the pupal case of the tomato hornworm *Protoparce quinquemaculata*. Some of the birds in this group, when examined at the Ontario Veterinary College, were determined to have strychnine in their tissues.

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18 June 1957

REVIEWS

Flora of Manitoba

By H. J. SCOGGAN. Ottawa, Queen's Printer, 1957. 619 p: \$5.00. (National Museum of Canada Bulletin No. 140)

An acute need has been met by the appearance of a flora for the Province of Manitoba. This is the first flora to be published for the entire region, and more than replaces the erroneous and inadequate lists which have long served as the sole floristic record for the area. All those whose interests, directly or indirectly, are related to what is known of

the complement of vascular plants of Manitoba, and of Central Canada in general, will be gratified by the printing of this National Museum of Canada bulletin. To the small band of botanists whose professional interests include the area covered by the flora, it will serve as a reliable repository of information and a framework for extended enquiry. To the naturalist and student botanist, it will provide a serviceable guide to the native and introduced plants of the province. And for those in the applied sciences—

foresters, agriculturists, conservationists and others—it will be indispensable both in the field and in the laboratory.

That Dr. Scoggan has eliminated a vast lacuna in our floristic inventory is shown clearly by the fact that his flora includes 204 entities for which no published report had existed, although many of these plants scarcely qualify as rarities.

The flora is introduced by a short account of the early collecting and records, with references to more recent reports and collectors. This is followed by an account of the main geological features of the area, a section which would have been enhanced by the inclusion of a map. It seems rather inadequate, but probably in the tradition of many floras and manuals, to present little more than the bald facts of surface geology of a region. The next step might have been taken, and some indication made that the major physiographical regions do, in fact, bear characteristic flora, and that in this area the nature of the substratum is probably important in determining relative floristic diversity. The section on vegetation under "Climate and Vegetation" is based on the old and in some ways dated system of Halliday. An unfortunate feature here is the inclusion of tediously long lists of species with no indication of relative abundance or exclusiveness. The heading is "Vegetation," but the treatment is really floristic.

There follows a short section on the geographical affinities of the flora. Again, the treatment is rather traditional, but perhaps of necessity in this first comprehensive publication. Many of the interesting and critical phytogeographical aspects of the flora of the area are masked by the breakdown adopted here, and future strictly phytogeographical treatments will certainly result in a more meaningful and illuminating account.

The main part of the flora consists of artificial keys to the 113 families, 495 genera and 1541 species, subspecies and varieties which are included in the indigenous and introduced flora of the province. For each entity commoner synonymy

is indicated, together with a few cryptic comments on ecology, notes on distribution in the province and other published reports, followed by an account of the general distribution. A useful and helpful feature of the keys is the inclusion of plants which have not actually been recorded for the province but which might be expected to be added to the flora. Of necessity, the keys are relatively technical, and they will bring about the early eclipse of all but the most ardent amateur botanist.

Taxonomically, the flora conforms to the standard North American approach, with but a few inconsistencies. Dr. Scoggan has made no attempt to align the treatment with modern taxonomy, and his species and genus concepts seem to follow those of Gray's Manual. Peculiar exceptions are his acceptance of *Parnassia multiseta* and *Galium septentrionalis*. But the complete absence of nomenclatural innovations, while it postpones again a taxonomic (and agonizing?) reappraisal, is consistent with the conservative approach. However, it is more surprising that this work, on a large and poorly known area, should include not a single description of a new entity. Certainly Dr. Scoggan has set the stage for extended and detailed investigation, both floristic and taxonomic.

The bulletin is well printed with few errors, but a more substantial cover and spine would have increased the life expectancy of the book.

J. C. RITCHIE

Assistant Professor of Botany
University of Manitoba

The New Way of the Wilderness

By CALVIN RUTSTRUM. New York, Macmillan, 1958. 272 p., illus. \$4.50.

Although the word *new* appears in the title, Rutstrum's book stresses the time-tested methods of the successful camper which are based on good equipment properly used by an experienced hand. At the same time the author points out how *new* developments are applied to those basic methods.

There have been many books on 'camping and woodcraft' since Kephart's classic of that name first appeared in 1916, but few of them show such breadth of experience as this volume does.

Rutstrum believes that there is no need to be uncomfortable in the wilderness. He describes how to use modern equipment to achieve comfort and real pleasure in the field. Although aware of all the classical techniques he is thoroughly practical in his praise of the aluminum canoe, the modern outboard motor and the flashlight as basic tools. He likes the fragrance of a spruce bough bed but achieves the desired effect by putting a few boughs near his air mattress on which he sleeps more comfortably after less preparatory work.

He discusses wilderness cooking by several methods and believes in a good well-balanced diet and a widely varied menu but shies away from such fads as foil cookery which he considers a novelty of limited use in real camping.

Rutstrum's experience is wide and his suggestions on camping in connection with summer travel on foot, and by horse, canoe, and auto, as well as on winter travel and camping, are the result of many first-hand tests under field conditions. His chapters on location finding and survival, if carefully followed, would do much to lessen the annual toll of lost hunters and fishermen. His suggested use of easily caught minnows as readily available survival food deserves careful attention. He also suggests the use of a light weight gill net for taking larger fish under emergency conditions.

The author's section on the use of the aluminum canoe for travel on ice and water at break-up and freeze-up times is the first published reference to that new art that has come to this reviewer's attention. His suggestion, however, of using an outboard motor, in reverse, to slow downstream travel through rapids may lead to damage of both motor and boat if an obstruction is encountered since in reverse the motor cannot tip up to pass over the obstruction.

In some sections of the book, inexperienced readers may wish for a little more detailed explanation of items that are treated well but briefly. Experienced campers will not agree with all of the author's suggestions. A great wealth of useful information is compressed into the 272-page text. While much of this is well suited to the needs of the user of modern well-equipped campgrounds, it will be of even greater value to the real wilderness traveler.

Typographical and factual errors are few; the type though small is easily read. The book will find its place in many campers' libraries where its value will increase with familiarity. The author has performed a great service to the growing number of outdoor enthusiasts.

V. E. F. SOLMAN

Assistant Chief
Canadian Wildlife Service

The Snakes of Ontario

By E. B. S. LOGIER. Toronto, Univ. of Toronto Press [1958]. 94 p., illus. \$4.95.

This book was written expressly for children because, as Mr. Logier observes in his introduction, "it has long been apparent that any attempt to educate the public into reasonable thinking about snakes, if it is to be successful, must start with the children, whose minds are still open to receive the truth." However, it will also serve as a valuable reference for adult naturalists throughout eastern Canada for the snake species treated also occur in Quebec, New Brunswick, Nova Scotia and Prince Edward Island.

The book contains a wealth of information and the organization and presentation are excellent. There are twenty pages devoted to such topics as feeding, reproduction, hibernation, usefulness of snakes and other related subjects. Pages 23 to 62 present a description of Ontario's sixteen species of snakes. The account of each species is neatly limited to two facing pages, and includes an illustration of the animal, a small map depicting its entire range in North America and a detailed one showing its distribution in Ontario.

The accompanying and carefully prepared text covers the size and structure, color, habits and habitat, and distribution of snakes in Ontario. Except for two photographs of rattlesnakes, all the illustrations, both color and black-and-white, are from Mr. Logier's own brush and drawing board. For clarity and detail these drawings surpass the hazy photographic reproductions so often seen in books about snakes.

The titles of the eight appendices are as follows: Synoptic List of Ontario Snakes, The Scientific Name, Key to Ontario Snakes, Determination of Sex, Keeping Snakes as Pets, Collecting and Preserving of Specimens, Glossary and Rattlesnake Bite. The last appendix should be read by children, parents, and doctors alike. Mr. Logier has condensed this subject into an authoritative 11-page treatise on rattlesnake bite. One reading of the gruesome developments which follow rattlesnake bite should convince readers that one should learn to recognize rattlesnakes and leave them alone. All cases of fatalities in Canada have been due to persons who deliberately attempted to handle a rattlesnake.

SHERMAN BLEAKNEY

Herpetologist, National Museum

The BBC Naturalist

Edited by DESMOND HAWKINS. London, Rathbone Books, 1957. 93 p., illus. \$2.50.

This little volume is not at all a scientific work. It roams over a wide field without being either thorough or inclusive. What it does present (and very successfully) is the scientific naturalist being popular—not always an engaging sight. The book is a sort of distillation of the wonderful "Naturalist" broadcasts the BBC has been doing with unex-

pectedly great success. A point of view does emerge: an attitude combining respect for scientific thoroughness with pure human delight.

The approach varies with the authors of the brief contributions, starting with Peter Scott's thoughts on the painting of birds and ending with a half page by Field Marshal Lord Alanbrooke on some waders he saw. Between are equally diverse items. James Fisher has a report on the great avian crime wave in Britain which outlines a painstaking and prolonged detective job. The guilt of the tits, great and small, is beyond doubt in this mounting series of milk thefts. Feathered Fagins have been spreading the technique of prying off bottle tops for a couple of decades. In contrast is Frances Pitt's frankly sentimental account of her furred and feathered friends, she being one of those people who invariably have squirrels poking through their pockets.

The illustrations, photographs in both color and black and white, are numerous; in fact they are half the book in both space and interest. They are outstandingly good, considered as photography, printing, art or scientific record. Like the text, they are selected examples rather than a series bringing evidence to support a theory.

Most of the creatures considered are, naturally, British and do not occur in Canada. The methods of observation will be news to no Canadian naturalist, but I think many an observer in this country will enjoy an unusual and pleasant sense of kinship with his English colleagues.

STEPHEN DALE

Presentation Officer
Station, CBO, Ottawa

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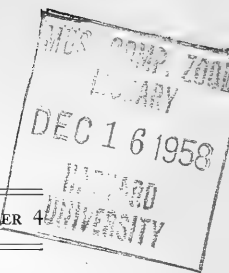
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ALBERT EDWARD ATTWOOD — A REMEMBRANCE

HERBERT GROH

472 Highcroft Avenue, Ottawa 3, Ontario

THE DEATH of A. E. Attwood on September 30, 1957, at the age of 92, would pass unnoticed by most members of the Ottawa Field-Naturalists' Club, since it is just short of 50 years ago that he guided its activities as President for two years. He had already served for nearly ten years on the Council of the Club. It was early in his term of office that I came to Ottawa and became a member. Deeply appreciating his fine qualities, I consider it a privilege to bring to later members a few particulars of his long and active career.

Mr. Attwood was a son of A. C. Attwood, a farmer near London, Ontario, whose interests evidently extended beyond the growing of good crops, for a letter preserved relates his submitting plant specimens for identification. The son attended Strathroy Collegiate Institute and attained exceptional scholarship in the entrance examinations. In 1889 he came to Ottawa Normal School from which he emerged as a gold medalist. As an interlude from teaching in Ottawa schools he went to Queen's University, graduating M.A. with first class honors, and with specialist standing in natural science. For some years he paid close attention to the botany of the Ottawa district. On the excursions of the Club he was an enthusiastic leader.

As a successful teacher and later Principal for 26 years of Osgoode Street Public School, Mr. Attwood also delved into the psychology of his field, as revealed in an address before the Field-Naturalists' Club on January 4, 1910 (abstracted in the next *Ottawa Naturalist*) on the subject 'Instinct and Education.' One of my abiding recollections of him is of his chairmanship of a lecture at Lisgar Collegiate Institute delivered by Prof. R. G. Moulton on "The Book of Job"; and his really exuberant thanks to the eminent lecturer at its close. I remember, too, his transfer of the early Club library from the Osgoode Street school to custody of the Carnegie Library, and his invitation to me to cull over such 'leavings' as had any interest for me. Some of these have since been returned to the stockpiles of the *Naturalist* as of more value in completing sets for sale than some later issues wanted in exchange.

During late years Mr. Attwood was occasionally interviewed by Ottawa papers, at which times he was able to remark significantly on changes in his time. Intriguing memories would be recalled. When once he had before him the daughter of a former pupil's daughter (also a pupil) he "thought it must be getting near time to retire." Among other former pupils were the future Mayor Stanley Lewis, H. Stanley Higman, Rev. Llewellyn Graham, and Harold Short, President of Kenwood Mills, Arnprior.

In retirement he kept well abreast of the times and, to indulge his urge for activity, conducted for a time a newspaper column, "Educational Recreation," which was essentially a test of broad reading and information on the part of his

Mailing date of this number: 28 November 1958

readers, to be checked against answers below. Indicating also the breadth of his interests was his attendance at a dinner of the Agricultural Institute, where he indulged, perhaps, nostalgic memories of his own early identification with agriculture. This dinner proved to be the scene of my last personal meeting with him.

In 1899 Mr. Attwood married the former Margaret Kee of Ormstown, Quebec, who came to the staff of the Ottawa Ladies College in 1892. She died in 1947. Their three daughters are: Mrs. George Troop, Toronto; Mrs. W. H. Troop, Ottawa and Mrs. John A. Chivers, Winnipeg.

As lately as May 24, 1956, Mr. Attwood wrote in the clear, flowing hand which was always his, thanking me for a copy of the 75th Anniversary issue of the *Canadian Field-Naturalist*. He closed with the observation that "of the list of Past Presidents I was personally acquainted quite intimately with 26 of them."

It is well that the members of the Club should know and retain memories of those stalwarts who have gone before. Too many of them have slipped away already almost forgotten. They served us truly in their day; we reap from their labors.

DIAPTOMUS (MIXODIAPTOMUS) THEELI LILLJEBORG (COPEPODA, CALANOIDA) FROM ARCTIC ALASKA¹

EDWARD B. REED

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Saskatoon, Saskatchewan

ON AUGUST 14, 1955, during an investigation of the entomostracan fauna of the Colville River drainage, a small number of diaptomids referable to *Diaptomus theeli* Lilljeborg were collected from a small tundra pond near the confluence of the Colville and Itkillik Rivers on the Arctic Coastal Plain at about 70°11' north latitude. The plain is a tundra area of low relief dotted with many water bodies ranging from a few feet to a mile in diameter. The pond from which about a dozen adult males and ovigerous females of *D. theeli* were taken was 20 feet long by 10 feet wide and half a foot in depth. Surface temperature was 57°F. Other crustaceans taken in the same tow included: *Cyclops vernalis* Fischer, *Cyclops capillatus* Sars, *Hetercope septentrionalis* Juday & Muttowski, *Daphnia middendorffiana* Fischer, *Polyartemiella hazeni* (Murdoch) and *Branchinecta paludosa* (O. F. Müller).

Since this appears to be the first record of *D. theeli* from North America it seems desirable to present a short description of the Alaskan form and to compare it with descriptions of the species from other areas.

FEMALE

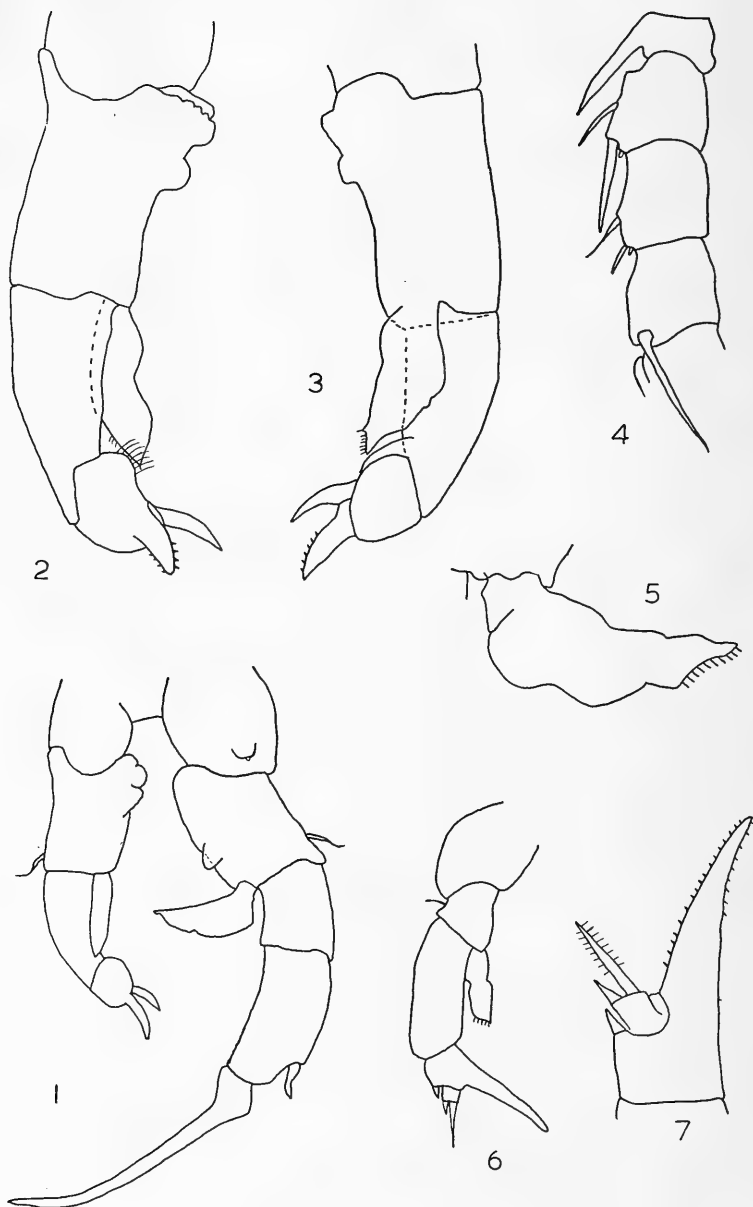
Antennules reaching to about the middle of the genital somite, with two setae on segments 11, 15, 16, and 17; one on segments 12, 13, 14, 18, and 19. Seta of segment 1 greatly enlarged, reaching about to segment 11; first seta

¹These studies were made possible by a contract between the United States Government and the Arctic Institute of North America. Reproduction in whole or in part is permitted for any purpose by the United States Government.

of segment 2 also enlarged reaching nearly to end of segment 7. Metasome segment 6 with posteriorly directed wings which are distinctly separated from segment 5, which bears laterally one small cuticular flap on the left posterior corner and two on the right. Genital segment symmetrical, exceeding the following two segments. Second urosome segment extremely abbreviated. Exopodite of fifth legs distinctly three-segmented, the third bearing two slender spines, the shorter about one third the length of the other which is finely spinulate on both margins (Figures 6 and 7). Smirnov (1929) calls attention to a small spine on the inner distal angle of the third exopodite, which he said had not been noted previously. This spine was not found on the Alaskan specimens. Lateral seta of second exopodite segment slightly exceeding length of third segment. Endopodite much shorter than first segment of exopodite, indistinctly two-segmented and somewhat constricted at midlength. Smirnov states that the endopodite may be either one- or two-segmented and Lilljeborg (1889) figures both conditions. Both authors indicate the joint at about midlength of the ramus. Grochmalicki (1921), however, indicates a joint very near the distal end. Sars (1898) and Rylov (1930) show the endopodite to be of a single segment. The oblique tip of the endopodite bears an inner spinous protrusion and a crosswise row of coarse, short hairs. Total length without terminal setae 1.5 mm.

MALE

Setation of left antennule same as that of the female. Spines on segments 10 and 11 of the right antennule are weakly developed, that of segment 13 about equal in length to segment 14 (Figure 4), segment 23 unarmed. Left leg of fifth pair extending to about the middle of right second exopodite segment (Figure 1). Left basipodite bearing a posteriorly and somewhat mesially directed protrusion (Figures 2 and 3), of which the proximal surface is rather scalloped or crenulate; a subquadrangular hyaline lamella projects from the posterior surface of the major protrusion. The margins of this lamella are variable; in the six animals examined, the condition ranged from completely smooth to a fine, uniform serration. Lilljeborg depicts this lamella with a smooth margin as does Grochmalicki. Sars does not show the lamella at all. Smirnov re-examined some of Sars' material and found a lamella with crenulated margins. Specimens examined in glycerine exhibited a smooth or at most fine serration, whereas the serration was more evident in the mounted material. It seems probable that distortion in mounting intensifies the serrated appearance. The left first exopodite segment is strongly curved and tapers to the noticeably rounded second segment. Processes of the second segment are subequal, the proximal slender, spinelike and finely denticulate, the distal heavier, blunter and more coarsely denticulate. Endopodite about equal to first segment of exopodite, terminating in a sharp point and bearing a few short, coarse hairs. The inner proximal portion of the right basipodite has a posteriorly directed rounded protrusion and bears on its inner surface a small hyaline lamella. The inner and outer distal corners of exopodite segment 1 are produced slightly. Lateral spine of exopodite 2 is small, terminal claw swollen at base, rather slender, and denticulate. The liguiform endopodite exceeds the first



Diaptomus theeli. Figure 1. Male fifth legs, posterior view. Figure 2. Male left fifth leg, postero-lateral. Figure 3. Male left fifth leg, antero-lateral. Figure 4. Male right antennule segments 13, 14, 15, 16. Figure 5. Endopodite male right fifth leg, lateral view. Figure 6. Female fifth leg. Figure 7. Female fifth leg, exopodite segments 2 and 3.

exopodite segment, terminates in a sharp point and is armed with a few coarse, short hairs (Figure 5).

Since the original description in 1889 by Lilljeborg, *D. theeli* has been infrequently reported. Smirnov (1930) summarized its distribution thus: northern Siberia, a series of localities in European USSR, and Poland.

Smirnov (1930) supports Rylov (1928) in considering *D. theeli* var. *lithuanica* Grochmalicki to be identical with the typical form and points out that *theeli* is subject to considerable individual variation in several somatic characters. Perhaps this accounts for the differences in degree of crenulation of the lamella on the left basipodite.

D. theeli joins a growing list of diaptomids which are known to have wide distribution in Europe and Asia but appear in North America to be restricted to the far northern regions. Other species of this pattern of distribution collected along the Colville River include *Diaptomus gracilis* Sars, *Diaptomus bacillifer* Koebel, *Diaptomus glacialis* Lilljeborg. Further affinities between the diaptomid faunas of Asia and North America are furnished by *Diaptomus arcticus* Marsh, *Diaptomus pribilofensis* Juday & Muttkowski and *Diaptomus alaskaensis* M. S. Wilson. The relationships of *D. alaskaensis* and *D. pribilofensis* to Asiatic species have been pointed out by Wilson (1951 and 1953). *Diaptomus eiseni occidentalis* Rylov reported from Siberia is presumed to be a synonym of *D. arcticus* (Wilson, *in press*). These three species were also frequently collected along the Colville.

Two diaptomid species recorded as occurring in Alaska and Eurasia but not collected along the Colville are *Diaptomus kurilensis* (Kiefer) and *Acanthodiaptomus denticornis* (Wierzejski).

The writer wishes to thank Mrs. Mildred S. Wilson of Anchorage, Alaska, for the loan of literature, for criticizing the manuscript, and for invaluable aid, generously given in the study of these copepods.

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DOLPHINS IN NEWFOUNDLAND WATERS

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SERGEANT and Fisher (1957) recorded the presence of common dolphins *Delphinus delphis* L. on the offshore banks of Nova Scotia in late summer and autumn 1954, the species apparently being common at this time of year in the region of 'slope' water which lies between the Gulf Stream and the colder waters of the Nova Scotian coast. Sea surface temperatures recorded at the localities of sighting were between 13 and 17°C.

The records described below extend the distribution of *Delphinus* northward in the northwest Atlantic to the region of Newfoundland.

(a) A male common dolphin was shot in Dildo Arm, Trinity Bay, Newfoundland (47° 32' N., 53° 33' W.), on July 22, 1957, by the crew of the whaling vessel *Arctic Venture* owned by the Department of Fisheries of the Province of Newfoundland. The ship was at the time engaged in driving to shore a herd of some 155 pilot whales *Globicephala melaena* (Traill), and the dolphin though evidently alone of its kind was associating with the pilot whales. The pilot whales were the first to be seen and captured in 1957 in Trinity Bay, the site of an extensive fishery for this species. For a description of the fishery for pilot whales in Newfoundland and their migrations, reference is made to the paper mentioned above.

The dolphin was examined by the writer a few hours after capture (Figure 1), and circumstances permitted rather full examination of external and internal characteristics. Measurements, given in centimeters, were as follows; total standard length 190 (6 ft 3 in.); projection of lower jaw beyond tip of snout 1.3; tip of snout to center of eye 34, to blowhole 34, to angle of gape 25, to tip of flipper 79; flipper length, axilla to tip 23; maximum flipper width 11; length at base of dorsal fin from anterior end of ridge to immediately below apex 28; vertical height of dorsal fin 22; span of flukes 47; notch of flukes to anus 53; anus to penis 18; penis to umbilicus 36. The weight of the freshly killed animal was 80 kg (175 lb). The number of teeth visible in the intact animal, on the right side, was 41 in the upper jaw and 42 in the lower; in the boiled-out jaws, the left side showed 42/44 and the right 43/44. The first chamber of the stomach contained remains (beaks and pens) of at least twenty small squid *Illex illecebrosus* Lesueur, which are abundant in this region in summer and form the principal food of the pilot whales. The testes weighed each some 37.5 grams, and histological examination of testis and epididymis showed no spermatogenic activity, though sexual maturity had evidently been attained. According to Kleinenberg (1956) male *Delphinus* attains sexual maturity at a mean length of 170 cm in the Black Sea.

Externally, the sides of the body showed rows of parallel scratches, these being fine and closely set, and so judged to have been made by other dolphins and not by the pilot whales. There was a single external parasite, a specimen about 15 mm long of the aberrant sessile barnacle *Xenobalanus globicipitis*

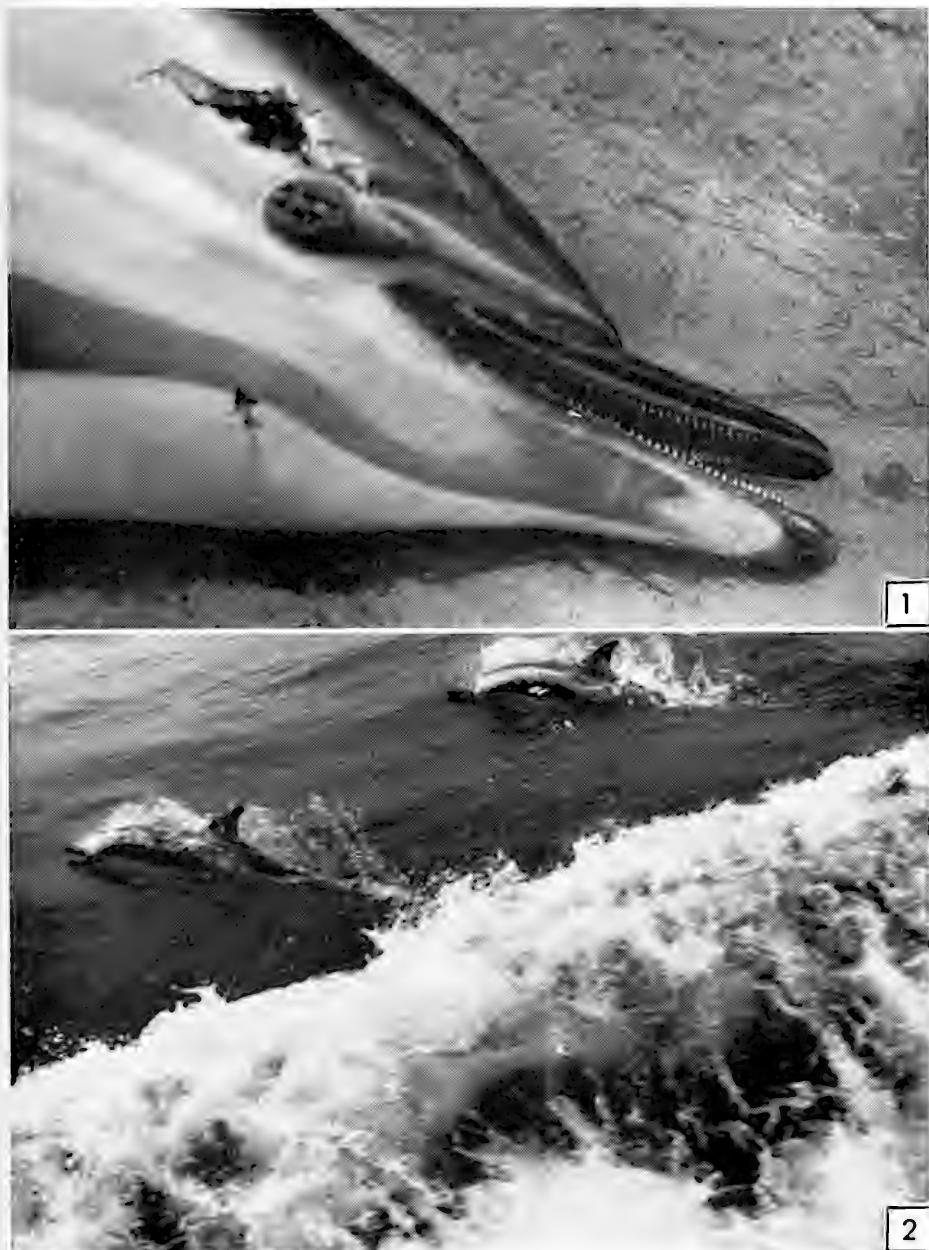


FIGURE 1. Head of *Delphinus delphis*, male, length 190 cm, captured in Dildo Arm, Trinity Bay, Newfoundland, on July 22, 1957.

FIGURE 2. Common dolphins breaching in the bow wave of the ship. Flemish Cap, 47°00'N., 44°32'W., August 1, 1957.

Steenstrup, attached to the dorsal surface of the right tail fluke. The skull having been broken by heavy bullets could not be saved; however the jaws are now in the collection of the Arctic Unit of the Fisheries Research Board of Canada, in Montreal.

In observations of Cetacea made in Trinity Bay for varying periods each year from 1952 through 1956, the writer had obtained no previous record of *Delphinus*, although the dolphins *Lagenorhynchus acutus* and *L. albirostris* were both encountered (Sergeant and Fisher, as above). The animal was strange also to the whaling captain and mate, who have a lifetime's experience of hunting in the bay and some ten years of whaling there. *Delphinus* is known to be an inhabitant of tropical and warm temperate seas, a social species and a fish-eater. The circumstances of the present record—the solitary young male with atypical food—combine to suggest that the animal was a wanderer outside the normal range of the species. The sea surface temperature close to the place of capture on the same day was 11.3°C. The writer is indebted to Capt. Clarence George and to Arctic Fishery Products Ltd., South Dildo, Newfoundland, for allowing examination and collection of specimens from this animal.

(b) A school of *Delphinus* was identified by the writer at approximately 47° N., 44° 32' W. (over the east side of the bank known as Flemish Cap, east of the Grand Bank) on August 1, 1957. He was then taking part in a hydrographic cruise of the M.V. *Investigator II* operated by the Biological Station of the Fisheries Research Board at St. John's, Newfoundland. The school was estimated to contain 30 to 40 individuals, which approached the ship for about 20 minutes, alternately swimming alongside, 'riding the bow wave' (Figure 2) and racing ahead, with the ship traveling at about 9 knots. Having examined the dead specimen only 9 days previously, the writer found sight identification easy, recognition characters in the water including: the black stripe from eye to beak, the buff-gray patch on the anterior flanks, the two gray streaks on the posterior flanks, and the dark brown color of the back. The upper side of the flipper in all animals appeared white, which was surprising in view of the fact that the flipper of the specimen, agreeing with the customary description, had been black. However, it was noted that the top of the beak and part of the caudal peduncle also appeared white, the extent of the white varying with time in any one individual. It was therefore deduced that the white color was the result of cavitation of water round these body areas. These observations show that the apparent color pattern of dolphins seen in the water may not always be the true pattern.

Temperature studies carried out on this cruise showed that the area of the sighting lay in water of intermediate temperature between the cold Labrador Current covering most of the Grand Bank and the warm North Atlantic Drift to the eastward. The surface temperature at the station nearest to the position of sighting, at 47°00' N., 45°00' W., was 11.38°C. Although temperatures close to the coast in the vicinity of St. John's were similar (11.53°C at 47° 32'50"N., 52° 35'10"W.) on July 29, surface temperatures over the main mass of the intervening Labrador Current were as low as 9°C.

(c) The species was not met with elsewhere on this cruise, which extended northward from the 47° N. parallel as far as the mid-Labrador coast. However, observations on Cetacea were made by the officers and scientific personnel of the *Investigator II* on a subsequent cruise which extended over the southern part of the Grand Bank and over St. Pierre Bank. A school of eight to ten dolphins was recorded at $42^{\circ} 50' \text{ N.}, 50^{\circ} 05' \text{ W.}$ (over the Tail of the Grand Bank) on August 23, 1957. A photograph taken by Mr. C. A. Rose of one of these animals shows the unmistakeable convergence of the dark and light markings on the side of a common dolphin. The surface temperature close to this locality at $42^{\circ} 56'30'' \text{ N.}, 50^{\circ} 16'45'' \text{ W.}$ was 11.10°C.

I am indebted to Dr. W. Templeman, Director of the Biological Station of the Fisheries Research Board at St John's, Newfoundland, for the opportunity to travel on the *Investigator II* and for permission to use these temperature data; to Mr. E. L. Rowe of the same Station for an enlargement of Mr. Rose's photograph, and to Dr. D. A. Parry of Cambridge University, England for pointing out the difference between turbulence and cavitation.

Sergeant and Fisher (as above) recorded billfish *Scomberesox saurus* (Walbaum) in the stomach of one of two common dolphins captured off Nova Scotia. This fish extends north to Newfoundland in numbers at the height of summer warming of the surface waters.

SUMMARY

Delphinus delphis is recorded from the southern edge of the Grand Bank, and from Flemish Cap, off Newfoundland, in late July and August. A single specimen is recorded from the coast of eastern Newfoundland in late July. All three records come from water of surface temperature between 11 and 12°C. These records extend the known distribution of the species northward in the northwest Atlantic in summer.

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THE NEWFOUNDLAND RACE OF THE GRAY-CHEEKED THRUSH

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ONE of the most painstaking and thorough accounts of any North American bird is the monograph of Bicknell's Thrush by George J. Wallace (1939), who in this paper discussed the taxonomy, distribution, migration, and home life of this heretofore little-known bird.

Dr. Wallace's paper, based on extensive research in the field and in the laboratory, is a model of what such a paper should be, and his conclusions are so well worked out that they have won general acceptance. From an independent study I am fully convinced of the correctness of the facts in the case which he so ably presents, but I would suggest that we may now be justified in taking some further steps along the lines he laid down.

Dr. Wallace adduced fairly conclusive evidence to show that Lafresnaye's type specimen of *Turdus minimus*, assumed by Bangs and others to be an example of Bicknell's Thrush, could not actually be that form, but must belong to the larger race, the Gray-cheeked Thrush, long known as *T. aliciae* Baird. He went on to show that while Newfoundland birds differed from mainland examples in coloration (but not in size) the difference was, in his opinion, not sufficient to entitle them to formal separation as a subspecies. He preferred to think of the Newfoundland bird as a color phase, but admitted that Lafresnaye's type specimen appeared to belong in that group.

I have examined the specimens from Newfoundland which Dr. Wallace handled, and also a series of twenty-six adult specimens collected in that country between the years 1942 and 1945 by Harold Peters and Thomas D. Burleigh, authors of *The Birds of Newfoundland* (1951). In my opinion the Newfoundland specimens represent a separable race, easily recognizable by the browner, less olivaceous color of the upperparts and wings externally (this variable within limits), by the more decided buffy suffusion of the breast, by the more brownish (drab or light drab) shading of the sides and flanks instead of dull grayish olive as in the mainland race, and by the greater extent of the pale color on the mandible. Viewed from below, the bills of northern mainland birds appear to be mostly blackish, only the base of the lower mandible being light-colored, but in Newfoundland examples this light-colored area is markedly more extensive. This difference must be even more obvious in the living birds. If Newfoundland birds represent a color phase, as Dr. Wallace contends, it is certainly a localized color phase, which is the equivalent of a subspecies.

In all the respects pointed out above, the type specimen of *Turdus minimus* Lafresnaye agrees with the Newfoundland series rather than with specimens of mainland birds, as Dr. Wallace has already indicated. While we thus agree as to the facts in the case, we differ in our interpretation of the facts. I agree further with Dr. Wallace in referring winter-taken birds from the Santa Marta region of Colombia to the Newfoundland race. The end result of the reidentification of Lafresnaye's type will be to restrict his name *minimus* to the Gray-cheeked Thrush of Newfoundland, and to restore the name *aliciae* of Baird (in a subspecific sense) to the bird of the mainland north and west of the Gulf of St. Lawrence. It is only fair to add that Dr. Wallace had anticipated such a possibility. Thus I submit that there are three rather than two races of the Gray-cheeked Thrush: *minimus* of Newfoundland; *aliciae* of the mainland, Labrador to Alaska and Siberia; and *bicknelli*, which will be discussed in my forthcoming work (See *Auk* 53:59, 1936).

I agree with Ripley (1952) and Dilger (1956, 1956a) in using *Catharus* instead of *Hylocichla*. The present study of *Catharus minimus* was undertaken

by the writer in connection with his long-delayed report on the birds of the Labrador Peninsula, but in view of the special interest attaching to the case, earlier publication has been suggested. The work was made possible largely through the courtesy of other institutions in the loan of specimens and in this regard thanks are due to the authorities of the U.S. National Museum, the Museum of Comparative Zoology, and Cornell University. The privilege of rehandling and comparing Lafresnaye's type of *Turdus minimus* was especially helpful. In the preparation of this paper 33 specimens of this race have been examined: 29 from various localities in Newfoundland and four from the Santa Marta region of Colombia. For comparison I have had 40 adult specimens of the mainland bird (June-July), from the Labrador Peninsula, Churchill, and Northwest Territories. Topotypes of *bicknelli* have also been available.

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THE LEECHES (HIRUDINEA) OF SASKATCHEWAN

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INTRODUCTION

DURING the past 30 years leeches have been collected from 47 localities (Fig. 1) in Saskatchewan. Lists of species found in some of these areas have been published in papers by Meyer (1946), Moore and Meyer (1951), and Rawson and Moore (1944). This paper includes those previously published and many additional records. Twenty species are now known to occur in Saskatchewan, of which only the ranges of six were found to extend into the northern part of the province covered by the Canadian Shield.

The chief sources for the present material include the early work in the Prince Albert National Park by D. S. Rawson; investigations of the saline lakes of Saskatchewan by D. S. Rawson, J. E. Moore and J. S. Thompson; various lake surveys supervised by D. S. Rawson and F. M. Atton; studies of reservoirs in the southern half of Saskatchewan by J. R. Nursall and R. A. Ruttan; and collections from Amisk Lake and Lac la Ronge by the writer.

ANNOTATED LIST OF SPECIES

The following is a list of the species of leeches and the localities in which they were collected in Saskatchewan. The system of classification is that of Pennak (1953). The numbers represent a reservoir or dugout, located in the area of the municipality preceding the brackets.

Order RHYNCOBDELLIDA

Family GLOSSIPHONIDAE

Genus *Glossiphonia* Johnston*Glossiphonia complanata* (Linn.)

Amisk L., L. Athabaska, Big Peter Pond L., Bigstone L., Churchill L., Echo L., Elbow (#26), Frobisher L., Jackfish L., L. la Ronge, L. Ile-à-la-Crosse, Last Mountain L., Little Peter Pond L., Murray L., Qu'Appelle River, Sturgeon L., Turtle L., Wakaw L., Waskesiu L., Wollaston L.

Genus *Helobdella* Blanchard*Helobdella stagnalis* (Linn.)

Amisk L., L. Athabaska, Big Peter Pond L., Bigstone L., Churchill L., Cree L., Echo L., Frobisher L., Jackfish L., Kerrobert (#58), L. la Ronge, L. Ile-à-la-Crosse, L. Pelletier, Last Mountain L., Little Peter Pond L., Matador (#42), Murray L., Redberry L., Rush L., Stoney L., Sturgeon L., Turtle L., Wakaw L., Waskesiu L.

Genus *Hemiclepsis* Vejdovsky*Hemiclepsis occidentalis* (Verrill)

Stoney L., Redberry L.

Genus *Placobdella* Blanchard*Placobdella montifera* Moore

Amisk L.

Placobdella parasitica (Say)

Last Mountain L., Qu'Appelle River, Turtle L.

Genus *Theromyzon* (Vejdovsky)*Theromyzon occidentale* (Verrill)

Jackfish L., Murray L., Qu'Appelle River, Turtle L., Waskesiu L.

Theromyzon rude (Baird)

Admiral (#50), L. Alma, Hanley (#25), Murray L., Matador (#42), Nesslin L., Tyvan (#33).

Theromyzon tessulatum (O.F.M.)

Assiniboia (#52), Biggar (#97).

Family PISCICOLIDAE

Genus *Cystobranchus* Meyer*Cystobranchus* sp.

Murray L.

Genus *Illinobdella* Meyer*Illinobdella moorei* Meyer

Last Mountain L.

Genus *Piscicola* Blainville*Piscicola geometra* (Linn.)

Bigstone L., Frobisher L., L. Ile-à-la-Crosse, Little Peter Pond L., Sturgeon L., Waskesiu L.

Piscicola milneri (Verrill)

Amisk L.

Piscicola punctata (Verrill)

L. la Ronge, Round L.

Order ARHYNCHOBDELLIDA

Family HIRUDIDAE

Genus *Haemopsis* Savigny*Haemopsis grandis* (Verrill)

Amisk L., Cree L., L. la Ronge, Waskesiu L.

Haemopsis marmorata (Say)

Amisk L., Madge L., Murray L., Stoney L., Waskesiu L., Wilson L.

Family ERPOBDELLIDAE

Genus *Erpobdella* Blainville*Erpobdella punctata* (Leidy)

Amisk L., Big Peter Pond L., Bigstone L., Churchill L., Cree L., Echo L., L. la Ronge, L. Ile-à-la-Crosse, Last Mountain L., Little Peter Pond L., Montreal L., Murray L., Qu'Appelle River, Redberry L., Sturgeon L., Trossachs (#2), Turtle L., Wakaw L., Waskesiu L.

Genus *Nephelopsis* Verrill*Nephelopsis obscura* Verrill

Amisk L., Assiniboia (#52), Big Peter Pond L., Churchill L., Dodsland (#49), Echo L., Ferland (#101), Handsworth (#11), Jackfish L., Kindersley (#5), L. la Ronge, L. Ile-à-la-Crosse, Little Peter Pond L., Lucky L., Murray L., Pense, Pike L., Sturgeon L., Turtle L., Wakaw L., Waskesiu L., Wollaston L.

Genus *Dina* Blanchard*Dina dubia* Moore

Matador (#42), Waskesiu L.

Dina fervida (Verrill)

Murray L., Turtle L.

Dina parva Moore

Echo L., Elbow (#26), Jackfish L., Murray L., Reindeer L., Turtle L., Waskesiu L.

DISCUSSION

Of the 20 species of leeches collected in Saskatchewan (Table 1) only four, *Glossiphonia complanata*, *Helobdella stagnalis*, *Erpobdella punctata* and *Nephelopsis obscura* are distributed over most of the province. In the Canadian Shield region two additional species occur: *Haemopsis grandis* and *Dina parva*. The ranges of all species (except *Dina dubia*) extend southward into the United States (Bere, 1931; Meyer, 1940, 1946; Moore, 1898, 1912). *Dina dubia* appears

TABLE 1. HIRUDINEA: NUMBER COLLECTED AND NUMBER OF LOCALITIES IN WHICH A SPECIES OCCURRED

Species	Number	Localities
<i>Glossiphonia complanata</i> (Linn.)	161	20
<i>Helobdella stagnalis</i> (Linn.)	320	24
<i>Hemiclepsis occidentalis</i> (Verrill)	—	2
<i>Placobdella montifera</i> Moore	1	1
<i>Placobdella parasitica</i> (Say)	29	3
<i>Theromyzon occidentale</i> (Verrill)	12	5
<i>Theromyzon rude</i> (Baird)	8	7
<i>Theromyzon tessulatum</i> (O.F.M.)	2	2
<i>Cystobranchus</i> sp.	1	1
<i>Illinobdella moorei</i> Meyer	1	1
<i>Piscicola geometra</i> (Linn.)	18	6
<i>Piscicola milneri</i> (Verrill)	5	1
<i>Piscicola punctata</i> (Verrill)	5	2
<i>Haemopsis grandis</i> (Verrill)	12	4
<i>Haemopsis marmorata</i> (Say)	6	6
<i>Erpobdella punctata</i> (Leidy)	90	19
<i>Nepheleopsis obscura</i> Verrill	121	23
<i>Dina dubia</i> Moore	8	2
<i>Dina fervida</i> (Verrill)	13	2
<i>Dina parva</i> Moore	40	7

to be a more northern species as it has been only previously reported from Great Slave Lake, N.W.T. (Moore and Meyer, 1951). As most of the specimens have been collected from the area south of the Canadian Shield, it is not possible at present to state for certain that this survey shows the northern limits of the various species.

Glossiphonia complanata, *Helobdella stagnalis*, *Erpobdella stagnalis*, *Nepheleopsis obscura*, *Piscicola geometra* and *Theromyzon tessulatum* occur in Europe (Bennike, 1943; Mann, 1955; Pawlowski, 1936). Except for the last two species, these are the common leeches in Saskatchewan (see Table 1).

The number of species found in Saskatchewan compares very well with the 21 species recorded from Minnesota (Moore, 1912); 18 species from Wisconsin (Bere, 1931); and 14 species from Illinois (Moore, 1898). It is not expected that many more species will be found in Saskatchewan.

ACKNOWLEDGMENTS

Thanks are extended to Dr. D. S. Rawson for his assistance in the preparation of this paper and for the provision of specimens. The writer also wishes to thank the following persons who identified leeches and checked some of the writer's identifications: Miss Ruby Bere, Dr. R. J. Meyers, Dr. M. C. Meyers, Dr. J. P. Moore.

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Corrections — Volume 71

Page 168, left column, line 1. *For* 1200 *read* 200.

Page 171, left column, 9 lines from bottom. *For* barns *read* burns.

NOTES

Black-throated Blue Warbler in Alberta

THE Black-throated Blue Warbler *Dendroica caerulescens* has been observed in Alberta on only four occasions. Since nothing has been published regarding any of these observations this note is intended to place on record what is known of the circumstances surrounding each.

In the collection of the University of Alberta there is a specimen of a male Black-throated Blue Warbler in full breeding plumage bearing on the label merely 'Edmonton, 1917.' This bird, together with colorful skins of three other species of warblers all bearing exactly the same data, was purchased with the collection of Mr. Edgar Jones. Mr. Jones informs us that he received these specimens from the late Mr. Wolfe, a professional taxidermist of Edmonton, but that he knows nothing further of their origin. Since Mr. Wolfe was not known to have a scientific interest in birds it appears doubtful that he was the collector. The name of the collector,

and with it the authenticity of the specimens, therefore remains uncertain.

The first reliable record appears in a letter dated October 21, 1928, from C. G. Harrold of Winnipeg to P. A. Taverner of the National Museum of Canada. Mr. Harrold, who collected birds at Beaverhill Lake, Alberta, for several years, wrote: "The Point (near Tofield, Beaverhill Lake) has not produced anything exciting this fall . . . except one rather surprising bird, a Black-throated Blue Warbler which I collected within 50 yards of the tent."

On June 3, 1957, an adult male Black-throated Blue Warbler was observed by the writer and Mr. David Boag on the banks of the Rosebud River about five miles east of the village of Rosebud, Alberta. Singing repeatedly, the bird moved through the underbrush of willow and poplar thickets for some distance and crossed the river on at least two occasions before it was collected. Although its gonads were well developed its behavior indicated that it was probably a migrant. The specimen is in the Salt collection.

The most recent and the most unusual record was obtained through Mr. James Robinson of Edmonton who says that, on October 22, 1957, while on a hunting trip near Windy Point on the North Saskatchewan River about 12 miles southwest of Nordegg, Alberta, he noticed a bird which was attracted to the screen door of their cabin by the warmth within. It entered the cabin readily when the door was opened but succumbed during the night. The specimen was sent to David Boag, Department of Zoology, University of Alberta, and proved to be an immature male Black-throated Blue Warbler. This is an unusually late date for any species of warbler in Alberta. The bird must have survived heavy snowfall and temperatures close to zero which occurred earlier in October. The specimen is in the Boag collection.

These records suggest that the Black-throated Blue Warbler breeds in small numbers in extreme northern Alberta or in some adjacent region and points to the fact that vast areas to the north of us are as yet biologically unknown.

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4 November 1957

A Stranding of Killer Whales in Newfoundland

A SCHOOL of killer whales *Orcinus orca* (L.) was stranded at New Melbourne, Trinity Bay, eastern Newfoundland (48° 02' N., 53° 14' W.) on April 27, 1957. Identification was ensured by means of the lens-shaped patch over the eye. The animals were apparently forced ashore by heavy ice which had drifted into the bay, and were reported to have remained alive on the sandy beach for three days. On April 30 a crew from the whaling plant at South Dildo killed some of the whales and removed some 8,000 pounds of meat and 9,000 pounds of blubber from the animals. Owing to their size and awkward

position on the beach, however, they could not be completely flensed.

The author visited the site of the stranding on May 16, 1957, and recorded nineteen animals, although newspaper reports had earlier given a total of twenty-five. The sex and measurements of those animals which were accessible are given in the table. The measurements are regarded as accurate to plus or minus six inches.

Seven other animals were not accessible; five of these were estimated to be between 20 and 22 feet in length, and the remaining two to be between 12 and 15 feet.

This is the largest and also the seasonal earliest school of killer whales recorded around Newfoundland. The large size of the females is surprising, since it was generally thought that they attained a maximum length of about 15 feet. (See Norman, J. R., and F. C. Fraser. Giant fishes, whales and dolphins. London, Putnam, 1937).

SNOUT TO FLUKE-NOTCH MEASUREMENTS
OF KILLER WHALES

Males		
Ft	In.	Cm
23	3	708
23	3	708
22	0	670

Total 3

Females		
Ft	In.	Cm
24	7	747
22	0	670
20	10	635
20	6	625
19	2	585
18	0	549
12	9	388

Total 7

Sex Indeterminate		
Ft	In.	Cm
19	0	579
15	0	457

Total 2

The phenomenon of sea ice driving cetaceans into bays and causing them to

be stranded has previously been reported by D. E. Sergeant and H. D. Fisher (The smaller Cetacea of eastern Canadian waters, J. Fish. Res. Bd. Canada 14:93. 1957), when a school of white-beaked dolphins *Lagenorhynchus albirostris* was stranded at Seal Cove, Conception Bay, eastern Newfoundland, in March 1953.

J. C. DEARDEN

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26 July 1957

Blue Jay Flyway Near Ottawa

IN THE *Ontario Field Biologist*, No. 11, May 1957, appears a paper by D. E. Burton relating to a Toronto Blue Jay *Cyanocitta cristata* flyway. As a result of that account attention has been drawn to what appears to be another such instance along the Ottawa River.

On September 7 and 8, 1957, many hundreds of these birds were seen in flight at Woodland Boys' Camp between Luskville and Beechgrove, Que. The direction of travel was roughly from east to west, up the river, and just over the trees close to shore. Flights were intermittent. No attempt was made to secure counts.

On Labor Day weekend in 1955, just a week earlier, a similar movement was seen under way, over the trees, a little inland from Black Bay marsh off the river near Luskville. The direction was the same and would no doubt lead on over the camp grounds less than two miles ahead. Observations did not extend in either year beyond the weekend. Both Woodland and Black Bay were visited in 1956 at about the same date but migration, if any, did not arrest the attention.

The river at this point is wide, being the upper reach of Lake Deschenes; and the westward rather than southward movement may have persisted only to a narrower crossing of the Ottawa River. It is commonly held that Blue Jay migration is not a great deal more than local, and that winter residence at any point is mainly replacement of local migrants by others from a little to the north. The

passage near Luskville, earlier than at Toronto by two to three weeks; is in keeping with a progressive movement southward or southwestward.

HERBERT GROH

472 Highcroft Avenue
Ottawa 3, Ontario
30 October 1957

Some Birds of Jasper Park

A LIST of the birds of Jasper National Park, Alberta, was published by I. McT. Cowan in 1955 (Wildlife Management Bulletin, Ser. 2, No. 8, Dept. of Northern Affairs and National Resources, Canada). It covers previous records for the area except for the material in Banfield's "Notes on the birds of Jasper National Park, Alberta" (Can. Field Nat. 68:9-10, 1954), which apparently appeared too late for inclusion in Cowan's report. During a stay of two weeks near the town of Jasper in August, 1957, I made a few observations which seem noteworthy in view of present knowledge of the local avifauna as summarized in the above two publications.

PECTORAL SANDPIPER *Erolia melanotos*. This sandpiper has not previously been recorded in the park. One was seen with other shorebirds at a pool on Cottonwood Creek (near Patricia Lake) August 19 and 21.

STILT SANDPIPER *Micropalama himantopus*. Two were seen in the same locality on Aug. 19 and later on the 20th and 21st, there were four. There is only one previous record, cited by Cowan (1955).

GYRFALCON *Falco rusticolus*. A gray Gyrfalcon was seen in Wilcox Pass on August 20. It was harrying a Pintail on a small alpine lake. The falcon made several passes at the swimming duck which escaped on each occasion by a short dive. At our approach the Pintail took off and was pursued for a short distance by the falcon which, however, was soon left behind and it returned to perch on a rock beside the lake. The falcon was seen at close range. It lacked the characteristic facial mark of a pere-

grine and was without anything resembling the distinctive under-wing pattern of the prairie falcon. It is curious that the only previous record for this hawk in the park was that of a white bird seen in July 1938 on the Columbia Icefield only about five miles from the site of my observation.

E. OTTO HÖHN

Department of Physiology
and Pharmacology
University of Alberta
Edmonton, Alberta
1 October 1957

Red-shafted Flicker and American Coot at Churchill Manitoba

ON June 4, 1957, a Red-shafted Flicker *Colaptes cafer collaris* dropped down the chimney of a staff residence in Churchill, Manitoba. After fluttering there for some time, it finally escaped into the kitchen of the building by way of a ventilating flue, only to meet with further misfortune when it fell into a sink filled with hot soapy water. It was brought to me in a half-dead state. In spite of every effort to revive it, the bird died.

On June 5, 1957, children playing among rocks along the sea coast found a dead bird which they brought to me. It proved to be an American Coot *Fulica americana*. This bird may have perished, as a number of others did, during a severe blizzard on May 31.

To verify the identification of these birds, I sent the Flicker and one of the Coot's characteristic lobed feet to Mr. R. W. Sutton, of the Manitoba Museum, Winnipeg.

EVA BECKETT

Churchill, Manitoba
24 June 1957

Clapper Rails in Nova Scotia

ON 23 September 1957 a field party of the Nova Scotia Bird Society consisting of John Comer, Wickerson Lent and the writer, observed a Clapper Rail *Rallus longirostris* for about half an hour at

Brier Island, Nova Scotia. We sat on the top of a knoll overlooking a dense marsh and small pond, back of the beach near the main lighthouse. In the marsh were a number of large logs that had been cast up by heavy seas. About 70 feet from us the Clapper Rail was standing at the end of one of these logs. We watched it through seven-power binoculars and, at the same time, checked the details with Peterson's *Field Guide*. Peterson describes it as "the large gray or gray and tan Rail," and this was a "gray" so there was no confusing it with the King Rail. Besides the color we noted the strong legs, long bill, striped markings of the belly and white patch under the tail. This last detail was observed by Comer and Lent when the bird turned and slipped down off the log into the dense vegetation with its head towards me. By this time I was within 10 feet of it, watching it from another log in the marsh.

A Clapper Rail was reported to the Nova Scotia Bird Society from Sable River, Shelbourne County, on 2 September 1957 by Samuel Chivers, and there are two very old records by Harry Piers (Trans. N.S. Inst. Sci., Ser. 2, Vol. 1, p. 395-410, 1894), one 12 May 1892, and one October 1893, both birds having been killed at Lawrencetown, Halifax County, Nova Scotia.

WILLETT J. MILLS

100 Spring Garden Road
Halifax, Nova Scotia
14 November 1957

Some Additions to the List of Birds of the Mackenzie Delta, N.W.T.

A PAPER on the birds of the Mackenzie Delta based on observations during a total of five years was published in 1943 by A. E. Porsild (Can. Field Nat. 57: 19-35) and some additional notes on this area were published by Höhn and D. L. Robinson in 1951 (Can. Field Nat. 65: 115-118). The observations below add another seven species, one of them found nesting, to the avifauna of this area. We

have also recorded additional observations for certain species for which Porsild had only limited data. Unless some reference to his paper is made in the notes below, the species referred to is one not listed by Porsild. Initials indicate which one of the undersigned is responsible for the particular observation.

Stevens' observations were made in the period 1947 to 1950 while he was working as mammalogist with the Canadian Wildlife Service at Aklavik. Höhn was in the area for three months in 1949 as temporary medical officer for the Indian Health Service, and again for three weeks in June 1955 on a journey part of which was supported by a grant from the Banting Fund administered by the Arctic Institute of North America.

PIGEON HAWK *Falco columbarius*. Two observations of this bird in 1949 have already been recorded (Höhn and Robinson, 1951). W. E. S. saw individuals of this species on several occasions on the East Channel in 1947-1950. E.O.H. saw a male on two occasions at Aklavik in June 1955. It is likely that this hawk will eventually be found nesting in the forested portion of the delta.

KILLDEER *Charadrius vociferus*. One was seen in Aklavik June 7, 1955. E.O.H.

LEAST SANDPIPER *Erolia minutilla*. A (presumed) male was seen performing its song flight about the town of Aklavik on June 7, 1955, while on the following day a pair of these birds was seen in the same general area. A nest with four eggs from which the bird was flushed, was found in a damp meadow on the outskirts of the town on June 20. E.O.H.

GREAT GRAY OWL *Strix nebulosa*. A specimen was collected during the winter of 1948 by Mr. Andrew Pilon at the Reindeer Station. W.E.S.

SHORT-EARED OWL *Asio flammeus*. Porsild gives only two records of sightings of several by Dr. C. H. D. Clarke in 1942. W.E.S. found it common, individuals most often being seen along the river channels and the shores of the delta lakes.

BOREAL OWL *Aegolius funereus*. W.E.S. saw one on September 27, 1947, along the Husky Channel about 25 miles above Aklavik. Its presence was made known by a pair of Canada jays which were diving at the bird on its perch at the top of a white spruce. A second bird was seen by the same observer on October 22, 1947, near Aklavik. It was sitting in a willow and allowed a very close approach before taking flight.

SAY'S PHOEBE *Sayornis saya*. Porsild recorded a pair which built a nest at Kittigazuit in 1932 but observed no others in subsequent seasons. W.E.S. found it not uncommon in the years 1947-1950, a pair nested for several summers at the Reindeer Station. A male collected there May 13, 1948, was gorged with Calliphorid flies which it had caught against the windows of a building. W.E.S.

TREE SWALLOW *Iridoprocne bicolor*. Some were seen in the vicinity of Cliff Swallow colonies in Aklavik on June 9, 1947, and again in subsequent summers though none was seen outside the town-site. W.E.S.

WHEATEAR *Oenanthe oenanthe oenanthe*. This species is a summer inhabitant of the Richardson Mountains on the western edge of the Mackenzie Delta. A male, seen July 3, 1947, at Black Mountain, 35 miles above Aklavik, was collected by Dr. Ian McTaggart Cowan. A male in song was seen on June 22, 1950, at the summit of Red Mountain about 15 miles from Aklavik. W.E.S.

NORTHERN SHRIKE *Lanius excubitor*. In "My Life with the Eskimo" by V. Stefansson (p. 436-494, 1913) R. M. Anderson is reported to have seen one near the northernmost spruce of the delta in 1909. Porsild did not himself see this species but cites the report of a resident who reported it on the Peel Branch. On June 25, 1947, W.E.S. found a pair among alder brush near the mouth of the Fish River, some twenty miles below Aklavik on the West Channel. These birds were found to be guarding seven young which had just left the nest. A female was col-

lected by Mr. Pilon at the Reindeer Station on May 13, 1948, but was destroyed by a cat before a skin could be prepared. W.E.S. A female was collected on the outskirts at Aklavik on June 20, 1955, but circumstances prevented a skin being made. E.O.H.

WHITE-WINGED CROSSBILL *Loxia leucoptera*. This species was found as a resident of the Mackenzie Delta in areas of heavy white spruce growth. An adult male collected near Aklavik on March 29, 1950, was found to be in breeding condition. W.E.S.

HARRIS'S SPARROW *Zonotrichia querula*. Porsild reported it as a rare spring migrant on the East Channel; one was collected in May, 1935. W.E.S. also observed it as a spring migrant and received a desiccated adult male taken in a trap set for small mammals on May 26, 1948, by Mr. A. Pilon.

W. E. STEVENS

Canadian Wildlife Service
Ottawa, Ontario

E. O. HÖHN

Department of Physiology
University of Alberta
Edmonton, Alberta
12 May 1958

Chipmunk and Garter Snake

ON April 20, 1957, Mr. K. W. Strasser and the writer were photographing spring wild flowers in a rich mixed woods near Peterborough, Ontario, when we heard a rustling in the dead leaves with which the woods were carpeted. Upon investigation, the rustling sound was found to be made by a chipmunk *Tamias striatus* which was worrying away at something not immediately evident. Upon closer examination it was discovered that the chipmunk was tussling with a perhaps somewhat sluggish but quite alive garter snake *Thamnophis sirtalis* about 14 inches long. The snake was writhing quite vigorously and the chipmunk was biting at its head. We watched from about 10 feet away as the

chipmunk subdued the snake and then dragged it into a nearby hollow log. The tail of the snake was still visible but now inert and the chipmunk continued to chew the head. We pulled the snake out of the log and stood back some eight feet to photograph the chipmunk as it came out of the log, grabbed the snake by the head once more, and again dragged it into the log. We pulled it out a second time, noticing that the head was now pretty well chewed to a pulp. When we finally had to leave, the chipmunk was still chewing at the snake but whether or not to eat it we were not able to find out. This episode of chipmunk versus garter snake may not be uncommon but it was new to us and to others to whom we have mentioned it. We obtained clear colored photographs of the combatants although without a close-up lens the subjects are fairly small.

JAMES L. MCKEEVER

7 Middleton Drive
Peterborough, Ontario
17 December 1957

Cowbirds Breed in Prince Edward Island

ON 5 August 1953 the writer saw an immature Brown-headed Cowbird *Molothrus ater ater* being fed by a pair of Magnolia Warblers at Stanhope on the Gulf of St. Lawrence Coast of Prince Edward Island. On 7 August 1954 the writer again observed an immature Cowbird being fed by an unidentified Warbler in the same area at Stanhope. At the time, no special importance was attached to these observations, but later a check of W. Earl Godfrey's "Birds of Prince Edward Island" (Bull. Nat. Mus. Canada 132, 1954) revealed that the above are the first known records for the breeding of this species in Prince Edward Island.

WILLETT J. MILLS

100 Spring Garden Road
Halifax, Nova Scotia
15 November 1957

A Yellow-throated Warbler at Manotick, Ontario

A YELLOW-THROATED Warbler *Dendroica dominica* (Linn.) was seen on November 4, 1957, at Manotick, Ontario, by the writer, Mrs. Terrill and Mr. H. A. C. Jackson. It was feeding actively in small trees and shrubbery fringing the bank of the Rideau River about fifteen miles south of Ottawa, in close association with a group of Black-capped Chickadees, White-breasted Nuthatches and Downy Woodpeckers, sedentary companions which would not, it is feared, lead the stray to migrate. Obviously they were much too slow for the warbler which flew back and rejoined them from time to time evidently determined to keep in touch with them. Occasionally it flew into the upper branches of a tall oak, but mostly it fed 20 to 25 feet from the ground where we had ample opportunity to observe it from all angles in the leafless trees. Occasionally it fed in bushes near the ground and it was also observed creeping along a limb in the manner of a Black and White Warbler. Finally it moved off with its companions in a southwesterly direction up the river.

Apart from the extensive yellow, bib-shaped throat patch, the broad white eye-streak and especially the unique and clearly defined black and white facial markings left no doubt as to the specific identity. As no yellow was visible in the lores we thought it was the more westerly Sycamore race (*albilora*) which is a decided wanderer compared with *dominica*.

The only Canadian locality mentioned in the Fifth Edition of the A.O.U. Check-list for the Yellow-throated Warbler is Stamford, Welland County, in southern Ontario. This entry is listed under *albilora*. A more surprising record for this race is of a specimen taken by Leslie Tuck in Newfoundland. This is mentioned by W. Earl Godfrey on page 138 of the *Canadian Field-Naturalist*, Volume 7, Number 3.

L. M. TERRILL

Ulverton, Quebec
2 December 1957

Early Meadowlark in Alberta

ON March 2, 1958, at 1.00 P.M. I saw a Western Meadowlark *Sturnella neglecta* at the corner of 89th Avenue and 156th Street in Edmonton, Alberta. I believe this to be an early-spring record for the meadowlark in this northern area.

The meadowlark flew across the road in front of my car and came to rest at the edge of a fencerow, perching on about a foot of snow. It remained there while I stopped about 15 feet away and observed it for about one minute.

The average snow depth in the Edmonton area on March 2 was about 10 inches. The weather was mild (30° to 40° F) with variable cloudiness, and a northwest wind of 15 mph. The weather throughout this winter has been exceptionally mild.

JOHN G. STELFOX

Department of Lands and Forests
Government of the Province of Alberta
Edmonton, Alberta
6 March 1958

Recoveries in Alberta of Banded Snowy Owls

IT HAS been the writer's contention that significant information on winter migration might be recorded for the Snowy Owl *Nyctea scandiaca* if sufficient numbers of these birds were banded during their winter visitations to the western prairies. Accordingly in the winter of 1954 banding work on Snowy Owls was commenced. This has been carried on actively every winter since then and the following recoveries of banded birds have so far been noted.

1. On 10 January 1955, a female wearing band No. 509-02669 was captured by the author in the Morinville district of Alberta. This bird had been banded exactly one mile from the recapture location on 4 March 1954 at the identical weight of 4 lb 10 oz. There was no significant color change in the plumage.

2. On 8 January 1957, a dead Snowy Owl wearing band No. 509-2684 was found by a farmer in the Namao district

east of Edmonton. The bird had been banded in the same area on 29 January 1955.

3. Another female with band No. 509-02679 was shot 12 miles northwest of Unity, Saskatchewan, on 21 January 1957. It had been banded in the Morinville, Alberta, area on 20 February 1955.

4. On 30 January 1958 a large female was captured by the author in the Beaumont area wearing band No. 509-03325. It had been banded by the writer on the identical quarter section on 15 January 1956. At that time the bird weighed 6 lb 2 oz, which was then and still is the record for the heaviest Snowy Owl of over 75 birds now having been weighed. At recapture the bird weighed 5 lb 4 oz and some of the darkness of her plumage was fading.

Three recoveries to date indicate a remarkable return movement to the previous winter area. Far more return information is required before a definite pattern can be delineated. The possibility that much completely new information on Snowy Owl movements will be unfolded as this study progresses is not at all remote.

ALBERT F. OEMING

The Edmonton Zoological Society
Room 6, 10126 100th Street
Edmonton, Alberta
8 January 1958

Cardinal versus Northern Shrike

IN February 1955, a female Cardinal *Richmondia cardinalis* was observed at a feeding station in Huntsville, Ontario. On February 16 this bird was killed by a Northern Shrike *Lanius excubitor* and the body was fortunately recovered when the Shrike flew against the windshield of a truck, dropping its prey, which was picked up by the truck driver. The skin is now in the writer's collection and as far as is known the finding of this bird constitutes the first authenticated record of the Cardinal in Huntsville.

In December 1957, a male and female Cardinal turned up at another Hunts-

ville feeding station, and later in the same month a second male was at another station only a quarter of a mile distant, both males being under observation at the same time. Apart from interest in these observations as evidence of northward extension of the Cardinal's range, it may be worth noting that these birds seem to be particularly harassed by Shrikes, although up to date of writing they have escaped. These facts seem to suggest that predation by the Northern Shrike in winter might have a significant effect on attempts of the Cardinal to establish itself in new territory.

RUSSELL J. RUTTER

Huntsville, Ontario
6 March 1958

Nashville Warbler Winters in New Brunswick

ON November 9, 1957, a Nashville Warbler *Vermivora ruficapilla* appeared at my feeding station at Kingshurst about seven miles from Saint John. Because of the warm fall I thought that it was an unusually late migrant. Mr. W. Austin Squires of the New Brunswick Museum suggested that it might have been injured in late August or early September, the usual migration time. After it had remained around my feeding station for about two weeks I realized that it might attempt to winter in the province. Its normal winter range is from southern Florida and southern Texas south to Guatemala.

Since the Nashville Warbler is thought to be almost entirely insectivorous its diet at my feeding station is noteworthy. It ate fat, suet, bread crumbs, chopped raw peanuts, several mixtures, and stale pound cake, its favorite food. It obtained moisture from grapes that I supplied regularly. It entered into a dispute over food only once: with a Myrtle Warbler *Dendroica coronata* on November 27; neither bird succeeded in driving the other away from the food.

Several times I found the Nashville Warbler traveling with five Black-capped

Chickadees *Parus atricapillus*. On such occasions it hunted for food on the ground (sometimes completely out of sight under dead grass) or very low in the brush.

During very mild and wet periods it disappeared, the longest time being four days, Nov. 18 to 21. Generally, the colder the weather the more time it spent at my feeding station. After cold nights it would sun itself for about a quarter of an hour in some sheltered spot. It would first appear at about 7.30 A.M. and disappear about half an hour before dark. During its stay it often uttered a 'pseet' call note. I did not find out where it stayed during the night.

From February 9 to 12 there were below zero temperatures at night. It must have succumbed to the cold on the night of the 10th because I did not see it after that.

DAVID S. CHRISTIE

East Riverside P.O.
Kings Co., N.B.
4 March 1958

A Colony of the Giant Slug, *Limax maximus* L., at London, Ontario

IN A previous communication (Judd, W. W., Can. Field Nat. 69:130-131, 1955) the writer reported on a dark specimen of *Limax maximus* collected in London, Ontario, in 1953. In June, 1957, a second occurrence of this species of slug in London was brought to the writer's attention, this time involving a colony of slugs. The slugs were found by Dr. D. Wilson in a backyard on Dufferin Street, well within the older part of the city and about a mile distant from the place at which the above-mentioned specimen was collected in 1953 (Judd, quoted work). The yard was behind a house and had for many years been occupied by a lawn, flower beds and fruit trees. The slugs were active at night and fed on young plants of zinnia, marigold and petunia and left glistening trails of mucus over sidewalks, boards and brickwork.

Eighteen specimens were collected on June 17 and 20. The six largest slugs, when in active movement, measured 15.8, 15.6, 14.8, 13.0, 12.8 and 12.8 cm, respectively, in length and the shortest was 3.2 cm long. Some of the slugs were dissected by the writer and by Dr. J. Oughton, Ontario Agricultural College, Guelph, and proved to be *Limax maximus* as identified by keys based on features of the digestive tract and reproductive system in H. A. Pilsbry's monograph (Acad. nat. Sci. Philad., No. 3, vol. 2, pt. 2, 1948).

The color of the slugs was like that of the specimen collected by Judd (quoted work), the general impression being that the animals were dark gray. The mantle was mottled with gray and black with a few light spots anteriorly. The dorsum of the largest specimens was traversed lengthwise by a dark gray stripe half an inch wide with two parallel black stripes, each one-eighth of an inch wide, extending along it just to each side of the mid-dorsal line. The sides of the body were mottled with dark gray and black. The foot of each slug was dull white.

The specimens, preserved in fluid, are deposited in the collection of the Department of Zoology, University of Western Ontario.

WILLIAM W. JUDD

Department of Zoology
University of Western Ontario
London, Ontario
18 April 1958

Parula Warbler and Indigo Bunting in Southwestern Alberta

Two interesting species were taken in June 1958 while the author was collecting avian specimens in the vicinity of the Alberta Biological Station. This station is situated some twenty miles west of Turner Valley and is at the base of the front range of the Rocky Mountains.

An adult male Parula Warbler *Parula americana* in breeding condition was taken on June 6. This bird was discovered singing in thick partially killed spruce

which surrounded a beaver pond. To my knowledge, this is the second record of the Parula Warbler west of south-eastern Manitoba; the other, at Fort Qu'Appelle, Saskatchewan, was recorded by Callin in 1956 (Blue Jay 14:90-91).

On June 23 a pair of Indigo Buntings *Passerina cyanea* was seen. The male was collected and found to be in breeding condition. On July 4 a second male was seen singing in the same vicinity and this suggests that the birds may have been breeding there. These buntings were inhabiting aspen poplar groves, similar to the habitat of the Lazula Bunting *Passerina amoena*, a common breeding species in this area. These birds form the third record of this species in Alberta. An adult male was taken at Lac la Nonne on June 3, 1926, and there is a sight record of an adult male from the Cypress Hills on June 26, 1952.

Both specimens collected are now in my private collection.

DAVID A. BOAG

Department of Zoology
University of Alberta
Edmonton, Alberta
26 August 1958

Albino American Coots Near Vermilion, Alberta

On July 12, 1957, on a lake three miles north of Vermilion in the parklands of Alberta, I observed by naked eye three birds that appeared to be white coots. On the next visit to the area on July 23, when I was accompanied by Mr. J. K. Lowther, we identified the birds as immature albino American Coots *Fulica americana*. They were found in a small bay on the northwest side of the lake, the same place where they had been observed previously. The water in the bay was about two feet deep. Scattered emergent vegetation was identified as soft-stem bulrush *Scirpus validus*; sago pondweed *Potamogeton pectinatus* and water milfoil *Myriophyllum verticillatum* dominated the submerged vegetation.

On August 3, one was captured alive and presented to the Calgary Zoo. Mr. Tom Baines, curator of that zoo, has since informed me that this coot died from undetermined causes in March 1958.

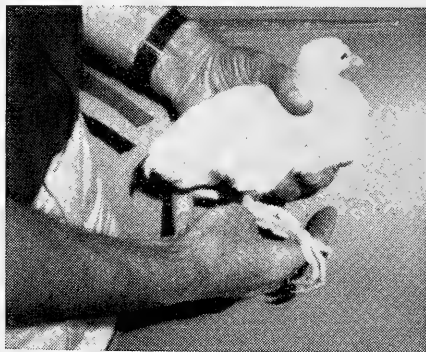


FIGURE 1. Albino Coot captured August 3, 1956, and donated to the Calgary Zoo.

On August 19, Mr. George Senz, Fish and Game Officer at Vermilion, and I captured one of the remaining albino coots for the National Museum. At that time the bird was almost fully feathered although the primaries were still sheathed and the bird was flightless.

The plumage of the two coots (Figure 1) was pure white. The eyes were pink. The legs, feet and bill were yellow, the bill a few shades lighter in color.

The occurrence of three albinos, apparently of the same age and in the same locality, would lead one to believe that they belonged to the same brood.

The third albino was not seen after the first visit to the lake. It is believed that it succumbed to predation or some other natural event. My impressions of the two captured albinos were that they were less vigorous than normal coots and were thus easily captured.

ROBERT E. HARRIS

Canadian Wildlife Service
728 Federal Building
Edmonton, Alberta
17 April 1958

PUBLICATION ANNOUNCEMENT

The Canada Department of Agriculture announces the publication by its Botany and Plant Pathology Division of a *Checklist of Plants of the Ottawa District*. The booklet may be had free of charge by addressing a request to the compiler, Dr. John M. Gillett, Botany and Plant Pathology Division, Science Service, Canada Department of Agriculture, Ottawa, Ontario.

REVIEWS

A Guide to Field Biology

By JOHN SANKEY. Toronto, Longmans, Green and Co., 1958. 166 p., illus. \$1.90.

In developing a very workable and useful guide, Mr. Sankey has put to good use the experience he has gained in his more than 10 years of teaching the field sciences and in his own researches in ecology.

He deals first with soils, discussing methods of formation and means of distinguishing the various types and methods of recording data on them.

He then describes, in excellently workable detail, methods for measuring and recording qualitatively and quantitatively the essential facts about the vegetative cover of the soils.

A detailed study of vegetation leads naturally to a study of animals from soil microfauna through the larger invertebrates to a brief mention of some of the smaller mammals and birds. Since animals must be secured for examination a useful section is devoted to methods and apparatus for collecting small animals under many conditions both in the soil and on it. The section of animal studies, like the one on plants, stresses ecological relations.

A short section deals with comprehensive surveys of plants and invertebrate animals.

Although the book deals primarily with the terrestrial habitat, a section of eight pages describes methods of study adapted to seashore and estuarine conditions.

A 16-page section on projects gives helpful details on 13 types of specific projects ranging from a study of badger life history in the field through testing color perception in the honeybee to the study of a wood. Reading references are provided with most of the project outlines.

Fourteen appendices greatly increase the usefulness of the book. They cover a variety of subjects including "Preserving Invertebrates," "How to Send Small Animals by Post" and "Keeping Weather Records."

A comprehensive general bibliography of 10 pages, divided by subject headings, is followed by a good eight-page index which supplements the five-page table of contents.

The book is well made and the type, though small, is quite clear and easily read. The 49 line drawings form useful supplements to the text.

Any person with an interest in field biology, amateur or professional, will find this a valuable source book for techniques for the study of soils, plants and animals other than vertebrates. Although designed for use in the British Isles, the general nature of much of the text suits it for use in any temperate area.

We are fortunate that so much useful information has been furnished in such an inexpensive book which slips easily into a jacket pocket where it is readily available for reference in field studies.

V. E. F. SOLMAN

Assistant Chief
Canadian Wildlife Service

The Breeding Biology of the Chimney Swift *Chaetura pelagica* (Linnaeus)

By RICHARD B. FISCHER. Albany, New York State Museum and Science Service, 1958. 141 p. (Bulletin No. 368)

For obvious reasons the nest life of this species is not easily studied and has been poorly known. This interesting study made over a number of years, mainly in Sullivan County, New York, fills a need of long standing.

W. EARL GODFREY

Warblers—Songs of Warblers of Eastern North America

Recorded by DONALD J. BORRER and WILLIAM W. H. GUNN. "Sounds of Nature" Series, Vol. 4, 1958. Federation of Ontario Naturalists, 187 Highbourne Road, Toronto 7, Ontario. \$5.95.

Warblers is the fourth and latest of the completely delightful "Sounds of Nature" series published by the Federation of Ontario Naturalists. The songs of 38 species of eastern warblers, skilfully recorded in nature by Borrer and Gunn, are brought together on the two sides of this long-playing record.

The songs are logically arranged so that the most confusingly similar songs may be readily compared and their significant differences noted. Several examples are chosen to show much of the variation in one or more songs of a given species and the two sides of the record contain a total of 400 songs from 170 individual birds of 38 warbler species. Each song

is unobtrusively but adequately identified by the pleasing voice of Thom Benson.

This excellent record should go a long way toward silencing that old bird-watcher's lament about having to learn the warbler songs all over again each year and which crops up annually as surely as spring brings the return of the warblers. Now, with this record and half a 'musical' ear, birdwatchers can learn at any season the songs of all the warblers likely to be met with in eastern North America and be ready to recognize them when they return in the spring. The voices of the warblers and the half-forgotten background sounds are so startlingly lifelike that they are sure to recall vividly many a pleasant day afield and at the same time stimulate anticipation of even pleasanter ones to follow.

W. EARL GODFREY

Curator of Ornithology
National Museum of Canada

Mountain Wild Flowers of Colorado

By RHODA N. ROBERTS and RUTH A. NELSON. Denver, Colorado, Denver Museum of Natural History, 1957. 69 p. (Museum Pictorial No. 13)

An appealing booklet with 50 superb color close-ups of the more attractive alpine plants, each supplied with a half-page of interesting and accurate nature notes. Half of the plants occur in western Canada.

W. G. DORE

Hurt Not the Earth

By E. NEWTON-WHITE. Drawings by THOREAU MACDONALD. Toronto, Ryerson Press, 1958. 188 p. \$4.95.

This book, as stated on the jacket, deals with the exploitation of our renewable natural resources, soil, water, forests and wildlife, in the development of Canada. It is also, as stated on the jacket, highly controversial.

The author, after a general and wide-ranging introduction of his thesis, deals with the history of and mistakes and problems in wildlife management in Canada. He then traces the history of forest use and misuse from days of first settlement to present date. He devotes a section to the forest fire problem.

Soil and water resources are then discussed, with special comment upon land colonization policies. A plea is very properly made for maintenance, in perpetuity, of maximum fertility of our soils. The author then devotes a section to the conservation principle as he sees it, and to the problems in maintaining such in our present age. Finally he devotes a section to summary and suggested remedies for the renewable resource crisis that he sees.

This book is so general that critical review, in the space permitted, is not possible. It may suffice to say that there is much basic truth in the history of resource exploitation as presented, but the almost complete lack of factual data in the presentation makes it impossible for the reader to judge for himself or herself just how wrong the actions were that were taken in the past, and just how serious the situation is today.

As to the present, one cannot say that all is well with our renewable resources—far from it. There is, as the author states, need for urgent interest and concern on the part of every Canadian. It is not believed, however, that the comments of the author, and the implications thus left, present a fair picture of the situation today, or for the last ten years or more at least. And it is hoped that few Canadians today will agree that our conservationists, conservation organizations and conservation policies constitute “. . . in general an inept, inadequate, hidebound system, completely impotent in the resource crisis now building up.” An apparent bias on the part of the author against government renewable resource agencies (which he feels are largely incompetent and weighted down with political appointees) and against big business, especially in the forest industry, will further detract from the value of his presentation to many readers.

Study of the facts contained in wildlife agency reports, and in reports on forestry and soils presented to the Royal Commission on Canada's Economic Prospects and to the Special Committee on Land

Use in Canada, emphasizes the need for caution in accepting too fully the sweeping, though colorful, generalizations on resource conditions made throughout the book. The progress of the last ten to twenty years, in building up resource organizations, in fact-finding, in technological knowledge and in action programs, will cause many to question the comment: “The nation built out of Canada is an achievement to boast about; boasting which has somewhat less point, however, *because here were the makings of something much greater than we have or can now hope to have.*” The italics are the reviewer's.

There is much more in the book with which one might quarrel, but some comment should be given for the credit side. Too few are willing to publicly place responsibility for good renewable resource management where it belongs, but the author consistently makes his point that the responsibility lies with each one of us. He is not afraid to speak of the “love of the land trait,” and to relate conservation to religion. So here again is a call for a land ethic and it is heartening to read. The author calls for public education and enlightenment in conservation principles, and for nongovernmental conservation agencies, employing their own professional scientists, to carry the story of our resource situation to the public as no government agency can do.

Ten remedies are suggested for the situation, and two of these at least will raise controversy. Economists and population experts, of which the reviewer is neither, will have a field day arguing the proposal that we “gear the national economic system to (renewable?) resource husbandry” and “effect such a population balance as will allow intensive home use of the resources. . . .” The proposal that our living resources be all returned to small private enterprise and ownership under regulation will raise the question, so often discussed among conservationists, of how far you can go, by regulations, in forcing the private individual, who has paid for his holdings, to use renewable

natural resources in a manner that will guarantee their maintenance undiminished in perpetuity. Nor can one dismiss the fact that today some of the best farm and forest management is being as well carried out by large corporations or enterprises as by private individuals. One cannot generalize; there is real need for serious thought of how the essential objective, that of resources in perpetuity, is to be achieved.

In conclusion, here is a book directed to much needed public information respecting renewable resource use in Canada. The underlying theme of need for public interest, understanding and action is good. It is suggested, however, that any prospective reader have at hand factual resource references, such as those mentioned earlier in the review.

W. WINSTON MAIR

Chief
Canadian Wildlife Service

Folk Names of Canadian Birds

By W. L. McATEE. Ottawa, National Museum of Canada, 1957. 74 p. 25 cents. (Bulletin No. 149)

Naturalists have long been indebted to this prolific American writer. Now, after years of research, Mr. McAtee has provided a fascinating account of the various names, English, Gaelic and French, by which birds are known. To read this book is to be at once enlightened in folklore and etymologically entertained.

R. A. HAMILTON

The Ring-necked Duck in the Northeast

By HOWARD L. MENDALL. Orono, Maine, University Press, 1958. 24 pl., 16 fig., 317 p. \$2.50. (University of Maine Studies, Second Series, No. 73)

This is one of the best accounts ever written about a single species of waterfowl. It is broader in scope than its title indicates and thus will be useful and interesting to both research ornithologists and game managers everywhere. This book is written in a pleasing style and shows the results of careful preparation. The illustrations and figures are attractive and useful.

Life history of the ring-neck is thoroughly treated under the usual headings: migration, courtship and pairing, nesting, the brood season, the postbreeding season, and the hunting season. There are also chapters describing the bird in its various plumages, its habitat, distribution, food and feeding habits, and chapters on measuring populations and productivity, and management.

Treatment of most topics is very thorough, not only through presentation and discussion of the data which Mendall obtained himself, principally in Maine and western New Brunswick, but also by means of skillful reference to pertinent items of the waterfowl literature. An outstanding feature of this work is that throughout effort has been made to interpret data as well as record them, and to relate the behavior of ring-necks to that of other ducks.

The ring-necked duck differs from other ducks in a number of ways, and it is these differences which make it such an interesting object of study. A point of particular note is that it is still actively in the process of expanding its range. The first recorded nesting in Maine was in 1937, although Mendall's enquiries lead him to believe that the species may have bred there half a dozen years earlier. Now ring-necks are second in abundance to the black duck in Maine and in many parts of the Maritime Provinces, breeding densities in favorable habitat being as high as one pair per five acres. Territorialism in the ring-neck is a quite different phenomenon from that exhibited by the black duck in the same region, and by other species of waterfowl in other regions, according to Mendall. He concludes that although the spacing of breeding pairs is a manifestation of territoriality, it is achieved almost entirely without indication of aggressive behavior. Mendall's discussion of this important subject is most stimulating.

The chapter on management well illustrates the value of detailed, long-term research. Studies of hatching success

were carried on in a variety of habitats where there is a wide range of variation in water levels. Interpretation of the results provided ideas which were tested on managed marshes with considerable success. It is noteworthy that in some areas the range of tolerance for breeding black ducks and ring-necks was found to be within a six-inch variation in water level. Because of the great variety in natural situations which waterfowl managers may try to improve, they will not be able to apply Mendall's findings directly but they will find in this book a most telling demonstration of the principles of habitat management.

Some of the data which this book contains were gathered during a 20-year period, and intensive field work was carried on for the 12 years between 1943 and 1955. It should not detract from the credit due the author to suggest that his work well points up the need for time and continuity in wildlife research.

DAVID A. MUNROE
Chief Ornithologist
Canadian Wildlife Service

Nature Photography at Night

By TAPPAN GREGORY. Denver, Colorado, Denver Museum of Natural History, 1957. 62 p., illus. (Museum Pictorial No. 14)

Two other issues of these pictorials have dealt with nature photography: M.P. No. 1, "Nature Photography with Miniature Cameras," and M.P. No. 5, "Nature Photography with the High-Speed Flash." The third member of the series deals historically with the fascinating record of Mr. Gregory who pursued the hobby of night photography of wild life for more than fifty years and gained wider experience than any other photographer in that field. Mr. Gregory has traced the evolution of equipment from open charges of magnesium flash powder to magnetic synchronizers and flash bulbs. The first-hand record of interesting experiences in the field is illustrated with 41 of the author's best night flash pictures of wild life.

V. E. F. SOLMAN

The Ecology of Invasions by Animals and Plants

By CHARLES S. ELTON. London, Methuen, 1958. 181 p., illus. \$6.00 (30/-).

The director of the Bureau of Animal Population at Oxford has presented a stimulating discussion of a problem that has an urgent appeal to nearly all biologists. At the same time the presentation is in simple enough terms to be clear to the layman interested in conservation and agricultural production. Workers in such applied fields as plant quarantine, plant pathology, and forest, agricultural or medical entomology will find data on problems analogous to their own and will find the theoretical discussions stimulating. Workers in such disciplines as ecology, biogeography, population dynamics, evolution and conservation will find a rich assortment of data gathered from many sources, Canadian included.

Slightly over half the book is given over to a discussion of Wallace's Realms and their geological background, to the vast and increasingly serious number of plant and animal invasions into new territories, and the resulting problems in population dynamics. The changing food chains that result from such invasions are then discussed. In a chapter headed the "Reasons for Conservation" the author presents the view that only by deliberately complicating, rather than trying more and more to simplify, our communities of economic plants and animals can disastrous outbreaks and fluctuations be limited. His thesis, based on mathematical, experimental and observational data, is that the simpler the population structure the more violent are its fluctuations. Somewhat surprisingly voles and lemmings are not mentioned in this connection, but one can scarcely overlook the fantastically violent fluctuations in the populations of these animals in the arctic where prey, predator and plant species are few, in comparison with the much smaller fluctuations that occur in southern Canada where all

elements of the community are more varied. In a complex community, with many competing species of hosts and parasites, predators and prey, food plants and cover plants, we have something analogous to a strongly buffered fluid: the introduction of a foreign element produces no runaway change but only a minor readjustment in structure. In a tropical forest the structure is so complex that such scourges and rapid changes as we are even now experiencing in our much simpler temperate forests cannot occur.

The remedy proposed in the final chapter is that we abandon our attempts at a rigid monoculture (the author's term for great stands of single crops in as nearly sterile surroundings as can be achieved) and to turn our backs belatedly on the barbed-wire engineering type of (self-styled) agricultural efficiency expert. The sterile monoculture, if it were fully realized, would be even more poorly buffered than the arctic fox and lemming population of the high arctic. The author urges the retention and extension of the hedgerow system of farm fields that has served so well in many parts of England. This suggestion is not entirely original—much the same thought was expressed by H. J. Massingham in *The Wisdom of the Fields*; and I do not doubt that Cobbett, who admired a good hedgerow, would have expressed it too if anyone in his day had had the temerity to suggest barbed wire as an alternative. But probably no logical and adequately reasoned support for hedgerow farming has hitherto been presented. One of Massingham's countrymen remarked to him: "I likes eddicated people but the worst of it is they be so dommed ignorant." It is quite clear that Dr. Elton is exempt from this stricture; he has kept touch with the living world. Moreover he cites encouraging preliminary findings of increased production under the methods that he advocates.

I find great satisfaction in this presentation of reasoned support for cultural

methods instinctively developed. I have boyhood recollections of rich Devon farmlands where the fields were both hedged and banked. And I remember, as we drank his cider after an afternoon's rabbiting, an old farmer, whose family has prospered on that farm for uncounted generations, explaining to us that the roadside banks were broader and unhedged because before the days of metaled roads folks traveled on the bank tops during winter rains. This man was truly a part of a balanced community, not a foreign influence wrecking its economy for a quick return.

This stimulating and thought-provoking book can be recommended unreservedly. I have no criticisms of the latter part and only a few very minor ones of the earlier chapters. I wonder whether the uniformity of the Cretaceous fauna was as great as it appears. After a hundred million years our perspective is desperately shortened and animals that seem to have occurred simultaneously in different continents may actually have done so a million years apart. On page 42 the author ascribes the richness of the Oriental Realm to the mountain barriers to the north. These mountains certainly served to increase the distinctness of this realm; but the richness was probably due more to its being wholly tropical and to the stimulus of intermittent penetration of the sea barriers in the Malay Archipelago. Finally I regret that Dr. Elton did not supply balance for his story of invasions by documenting one or two that have occurred without human agency; the invasion of and explosive spread within the Americas by the Cattle Egret might have served.

I am at a loss to explain why a book that sells in England for thirty shillings should be listed in Canada at six dollars. I am informed by the office concerned that books in this class are subject to neither duty nor sales tax.

D. B. O. SAVILE

Curator, National Mycological Herbarium
Canada Department of Agriculture

Alberta Bird Report for 1957

Issued by the Edmonton and Calgary Bird Clubs. Copies available from Mr. W. G. L. Twigge, Department of Extension, University of Alberta, Edmonton, Alberta. 10 cents.

Bird watchers in Alberta, residents or visitors, will be helped by this informative account of birds observed in 1957.

R. A. HAMILTON

Outdoor Rambles

By STUART L. THOMPSON. Toronto, Longmans Green, 1958. 147 p., illus. \$3.50.

Here is a book that may be recommended as an excellent gift to the budding teenage naturalist. It would also give delight to older persons who are only now discovering the pleasure of rambles in the great outdoors.

As indicated in the table of contents the usual chapters are replaced by 15 rambles and under each ramble usually two or three topics are discussed. The arrangement of the stories in a more or less seasonal sequence helps to blend the contents into an effective whole, but at times, despite the lively style, it is evident that the stories "have been reproduced before in some form." The book may be considered a pleasant introduction to more solid reading in natural history.

The author shows considerable descriptive power. In his account of a canoe trip in spring he recalls the "dainty bunch berry or cornel." In part he writes: "As the camper, bowed beneath the upturned canoe, toils over the portage he may not see the trilliums and other beauties scattered through the forest, but his moccasined feet are ever among the bunch-berry plants with their four-pointed flowers."

The author presents interesting encounters with small four-footed mammals, bats, insects and plants, but here he appears to be on less familiar ground. In fact when the author writes of the "anaemic appearance so typical of the fungus family," he surely has yet to

know his fellow naturalists' joy in mushrooming.

Found in the book are many tidbits on the origin of the common and scientific names of plants, but it seems unnecessary to state that the latter are "known only to really learned people." Also a wholly erroneous picture is drawn of Peter Kalm (1715-1779) and "Hugues" Jean-Francois Gaultier (?1708-1756) "as these two old cronies of those by-gone days strolling off into [the] Canadian forest." When Kalm, a pupil of Linnaeus, made his famous journey to North America and visited Gaultier, a "celebrated court physician and naturalist" at Quebec, he was under 40, and Gaultier, although probably not as vigorous, was only a few years older. Undoubtedly, they were aristocrats and a truer picture would be of two gentlemen on horseback in powdered peruke and elegant clothes dismounting from time to time to gather the new plant treasures that Gaultier pointed out to Kalm.

Despite the few misleading statements the book is most worthwhile. It is an attractive specimen of the printer's art; the typography is excellent and the 30 scratchboard drawings by Geoffrey Goss satisfactorily complement the text.

I. L. CONNERS

Senior Mycologist
Department of Agriculture

Translations from the Russian

A series of translations of Russian biological papers is being prepared by the Canadian Wildlife Service of the Department of Northern Affairs and National Resources. The following volumes have been issued, and may be purchased from the Queen's Printer, Ottawa, at the prices shown below. The general title of the Series is "Translations of Russian Game Reports."

Vol. 1. Beaver, 1951-55. 109 p., 50c.

Vol. 2. Muskrat, 1951-55. 224 p., \$1.00.

Vol. 3. Arctic and Red Foxes, 1951-55. 214 p., \$1.00.

The Behavioral, Ecological and Morphological Characteristics of Two Populations of the Alder Flycatcher, *Empidonax traillii* (Audubon)

By ROBERT CARRINGTON STEIN. Albany, New York State Museum and Science Service, 1958. 63 p. (Bulletin No. 371)

Two song-types of Alder Flycatcher are well known. Those breeding across Canada and into Alaska, New England, and northeastern United States sing *fee-bee-o*; those in the United States west of the Alleghenies sing *fitz-bew*. Studies near Ithaca, New York, where the two are sympatric, indicate that birds singing the *fitz-bew* song build more compact nests of somewhat different materials; have slightly smaller eggs with greater color variation; have different habitat preferences; have slightly shorter tarsi and longer bills than birds that sing *fee-bee-o*. The possibility is suggested that the two song-types may represent two distinct morphologically similar species.

W. EARL GODFREY

Fifty Years of Botany

Edited by WILLIAM CAMPBELL STEERE. Toronto, McGraw-Hill, 1958. 638 p. \$12.00.

Fifty Years of Botany, the Golden Jubilee Volume of the Botanical Society of America, presents forty papers of broad and general interest by many prominent botanists in diverse fields. Most of the contributions appeared as a series of Special Papers in volumes 43 and 44 of the American Journal of Botany, the official organ of the society. The last six in the book were presented in the Golden Jubilee Symposium of the Botanical Society of America during meetings of the American Institute of Biological Sciences held at Storrs, Connecticut, in August 1946.

To paraphrase Samuel Johnson, some papers are to be tasted, some to be chewed and a few to be digested. Individually they reflect the personalities and interests of the author; collectively, they achieve the aim of the volume to an admirable degree, an aim which is to "enable intelligent nonbotanists to under-

stand and to appreciate what botany is and what botanists are doing."

The volume begins with an account of the early history of the society by the president, Oswald Tippo. Then follows a list of fifty prominent botanists who were awarded certificates of merit at the fiftieth anniversary meeting. Dr. Tippo has brought together a fine collection of photographs of these men which are superbly reproduced with great clarity.

The subjects covered by the remaining thirty-three articles include applied microbiology, pathology, anatomy, morphogenesis, cytology, cytogenetics and evolution, taxonomy, botanical exploration, ecology, conservation, soil relationships, physiology, weed control, horticulture, medicine, history, algology, college botany, economic botany and botanic gardens. The six papers in the Golden Jubilee Symposium cover progress and achievement during the past fifty years in the fields of phycology, mycology, taxonomy, paleobotany, morphology and physiology.

There are a few papers that are conspicuously out of place because they go into too much detail and are too technical. These would be better found in a scientific journal of their respective disciplines for they do not contribute towards the accomplishment of the volume's aim. For example, the endless lists of species of Brazilian rain forest would interest only a small number of professionals and would be lost upon the nonbotanist.

As a Canadian I could not help noticing the slightly out-of-date account of Canadian botanical achievements in plant exploration and the misspelling of the names of two well-known Canadian workers. The volume nevertheless, not only achieves its aim but is a mine of general information to both the amateur and professional botanist and should find a place on their shelves.

The quality of paper and printing is of the finest and the prominent numbering of the papers makes for ease in piecemeal

reading. A brief but useful index is supplied. The all-gold cover while in harmony with the Golden Jubilee theme is a trifle gaudy, but on the shelf only the spine will appear.

JOHN M. GILLET

Plant Taxonomist
Department of Agriculture

Birds of Midway and Laysan Islands

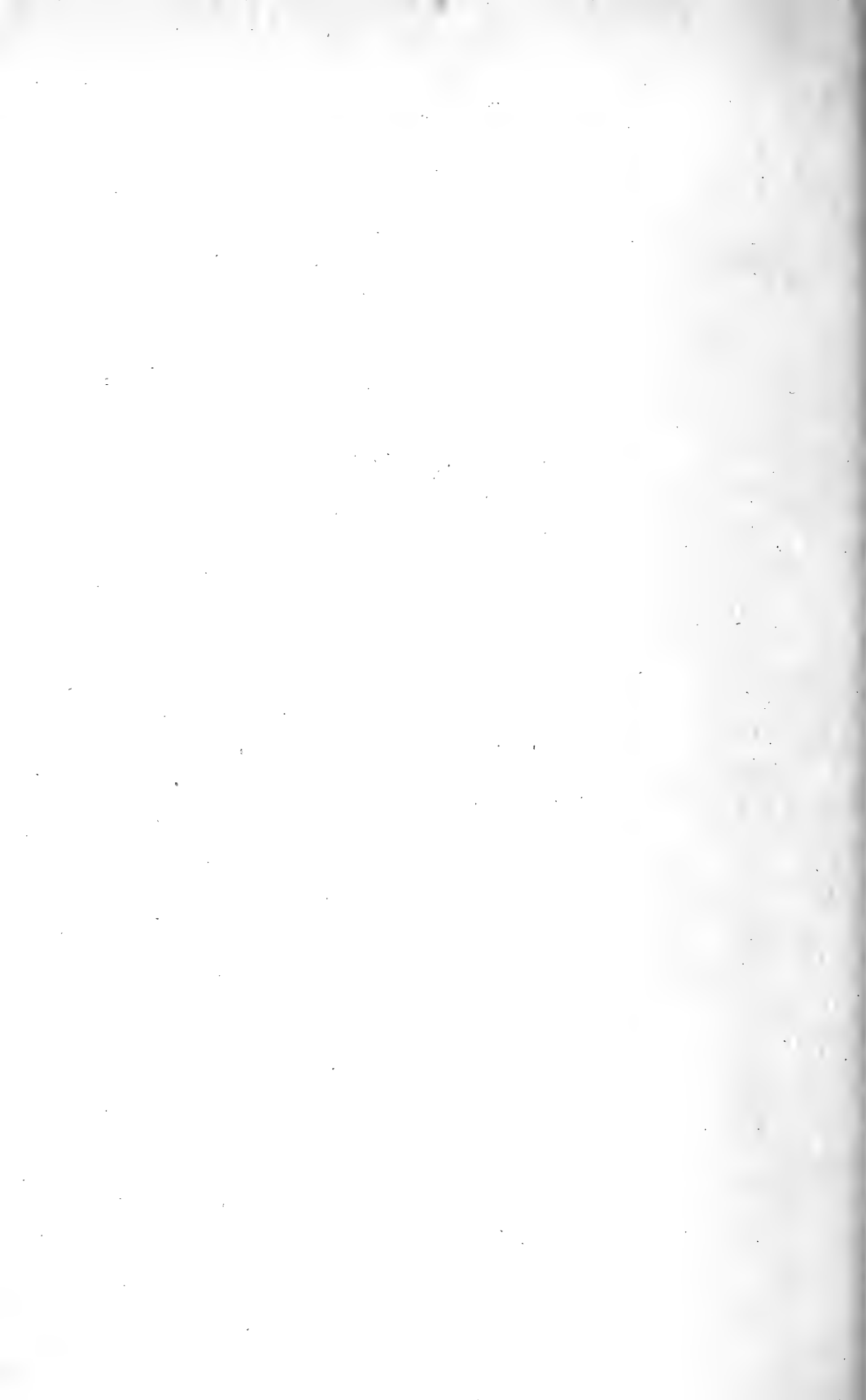
By ALFRED M. BAILEY. Denver, Colorado, Denver Museum of Natural History, 1956. 130 p. (Museum Pictorial No. 12)

Freely illustrated with black-and-white photographs, largely by the author, and with a colored portrait of the extinct Laysan Honey-eater, this book provides much information on the birds of these small islands of the western part of the Hawaiian chain. Birds of casual oc-

currence are also listed; and introductory chapters deal briefly with the history of the islands, their plants and mammals, and their ornithological history.

Here is the all too familiar story of the destruction of island endemics by thoughtless introductions; in this case the introduction of rabbits was the most serious single mistake. Some of the birds will be seen no more, and most of those that survive will not be seen by the majority of readers—a few, such as the Black-footed Albatross, we may see casually on the Pacific Coast. This excellent collection of photographs is thus of marked value in providing information that is difficult for the amateur to obtain about a number of unfamiliar species.

D. B. O. SAVILE



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